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# A Cut Above:
# Technonational Imaginaries in China's Operating Rooms

By

Bonnie O Wong

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Joint Doctor of Philosophy
with University of California, San Francisco

in

Medical Anthropology

in the

Graduate Division

of the

University of California, Berkeley

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Professor Lawrence Cohen
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Abstract

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Technonational Imaginaries in China's Operating Rooms

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Doctor of Philosophy in Medical Anthropology

University of California, Berkeley
University of California, San Francisco

Professor Aihwa Ong, Chair

What is surgery like in China and why does it matter? This dissertation is an ethnography of cancer surgery at one of China's top academic hospitals. Based on sixteen months of fieldwork over eight years, this dissertation looks at the inner worlds of surgery, following surgeons through their training, operations, teaching conferences, and political climbs. What makes surgery in China different is how surgery in China is enmeshed in larger political narratives. Each surgeon strives to be "a cut above," not just for personal success but out of a sense of duty to prove China's strength through numbers, metrics, and research, to further a narrative of medical-technonationalism.

Surgery is one of many tools which are now in service of the nation, attempting to prove something about China's strength. While my ethnography begins in the operating room, it extends outwards, to consider the specific configuration of technology, expertise, structures, systems, and ethical or moral norms which come together. Thus, I draw on Collier and Ong's concept of *global assemblage* to consider not only how surgical practice takes place in the context of tertiary academic hospitals in China, but also how global knowledge emerges from this context, and the barriers to how that knowledge is shared and circulated, and how that knowledge might be operationalized. What makes a "good surgeon" determines what surgeries can be done; what constitutes surgical knowledge determines what aspects of a surgery deserve to travel beyond a particular context. I show that the endeavors to legitimize, showcase, and prove China's distinction in and beyond the surgical field shape surgical practice in China.

*A Cut Above* captures China's healthcare system at a crossroads: simultaneously trying to prove their place within an international community and rejecting the need to "catch up" to others, determined to prove their strength on their own terms, through autonomy and decoupling from international expectations and norms. These tensions reflect China's global rise as the Chinese Communist Party (CCP) set policy goals to become a "technological and scientific leader" and China's role within the international scientific community has grown. Despite this, medical evidence from China is not taken seriously by the global scientific community. This dissertation explores these tensions, between state priorities and international norms, between national politics and personal ethics, between standardization and expertise to consider what an anthropology of surgery can teach us about China and global knowledge production today.

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## INTRODUCTION

Professor He, a gruff man who never seemed to warm to me over the many years I knew him, is internationally renowned for launching and a standardizing approach to gastric (stomach) cancer. He operates at least two days a week, and it is almost always the same operation: a radical D2 gastrectomy[1] to treat gastric cancer.

As a senior attending, he was often only present in the operating room for the key portion of each operation: in the case of the D2 gastrectomies, this was often careful, delicate dissection around key blood vessels which if inopportunely nicked could lead to exsanguination and death. Somehow, he always knew when this portion of the surgery was about to happen: he knew how fast each of the junior attendings operated, he knew which patients had anatomy that would slow down the surgery (more abdominal obesity, prior abdominal surgeries, etc.).

The room always went quiet when he entered the operating room, and quieter still when he began to remove the important lymph nodes; chatter died down, and those scrubbed and gowned leaned in to watch. Making no remarks, Dr. He did these dissections expediently, as if it were the thousandth time that he had done them. Though I never asked him for an exact number, I knew he had done thousands of gastrectomies in his storied career.

Based on my time with his operating group, he and his team (two junior attending surgeons and multiple rotating trainees) generally did four gastrectomy cases a week, fifty weeks a year. Occasionally he operated on weekends, traveling to other cities to provide his expertise. He had already been a senior attending for over a decade, easily accounting for two thousand lifetime cases, at minimum.

The first time I watched Professor He do a D2 gastrectomy, he finished the complicated dissection, removed the specimen *en bloc* from the operating field, and completed the anastomoses.[2] He then looked up at me and said:

"I bet you've never seen that before."

I had not: partially because I had yet to start my surgical residency and had completed only a few months of rotations in general surgery, but mostly because gastric cancer is very rare

---

[1] A gastrectomy is the removal of a stomach. However, as with all cancer surgeries, you cannot just remove the cancer itself, you must remove the cancer with wide margins around it, ensuring the remaining tissue is healthy. The edges (margins) of what is left behind are sent to a pathologist during the operation, in order for a "frozen" section to be read immediately by a pathologist, who calls back to let the surgeon know whether the margin is negative for cancer cells. If it is not, more tissue needs to be taken. Throughout the body, fluid drains into the lymphatic system and collects in a series of lymph nodes, fatty tissues which form a network throughout the body. Cancer cells therefore travel first to the lymph nodes closest to the original site of cancer, then slowly to other lymph nodes along the lymphatic systems, before metastasizing to additional organs.

A D2 gastrectomy describes an operation which removes the entire stomach (gastrectomy) plus an "extensive" lymphadenectomy, or removal of "associated" lymph nodes. The National Comprehensive Cancer Network (NCCN) guidelines recommend that gastric cancer resection include regional lymphatics including peri-gastric (around the stomach) D1 nodes as well as those along the left gastric artery, common hepatic artery, celiac artery, splenic hilum, and splenic artery (the D2 lymph nodes) with a goal of examining at least fifteen lymph nodes for to evaluate them for the presence of cancer cells. D2 gastrectomies were pioneered by Japanese medical centers, and Japan, Korea, and China have shown significant survival benefit to performing pancreas and spleen preserving D2 gastrectomies. "Radical" D3 lymphadenectomies add the para-aortic lymph nodes to those described above (also referred to as an "extended" lymphadenectomy).

[2] Anastomosis refers to the re-connection of two hollow tubes (e.g. two blood vessels, two parts of intestine, etc.).

in the United States.[3] But while Dr. He knew that there were many fewer gastrectomies done in America, where I was receiving my training, what he meant by his statement was that I probably had never seen a D2 gastrectomy with its associated careful lymphadenectomies.[4] I had never before seen the stomach and associated vessels placed on a sterile towel, each clump of fatty lymph nodes identified and removed by a designated trainee, lain out in a careful grid, then gathered and placed in individually labeled bags for pathological analysis and later, banked for future research.

I had never previously seen this operation. But, as a medical student enamored with complex surgical oncology, the more I understood about D2 gastrectomies, the more I appreciated the intricacy of the dissections and the detailed knowledge of variable anatomy in the foregut region required for these complex surgeries. As a medical anthropologist, the more I understood about D2 gastrectomies, the more they came to represent a much bigger question: what was different about surgery in China and did this difference matter? These specific operations were an entrée into an ongoing debate as to whether for certain diseases (like stomach cancer), Asian surgeons had better outcomes than "Western"[5] surgeons.

The D2 gastrectomies and Dr. He's proclamation that I had surely never seen this surgical approach provided the first of many examples of surgeons and surgeon-researchers pointing out and creating significance around difference and distinction. Dr He's point was simple: surgeons are doing something different — and better— in China, and he wanted me to take note of it.

---

I fell in love with surgery the first time I scrubbed into an operation. I was just out of college, a researcher on a multi-institutional qualitative project studying patient-physician mistrust in China. One of the surgical residents I had interviewed for the project had found out I had taken a course on surgery as an undergraduate student: that I knew how to scrub (to wash one's hands in preparation to enter an operating room), to gown and glove (to dress and protect oneself in a sterile manner), and to tie surgical knots (a specific knot which squares to prevent slipping).

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[3] Gastric cancer has a much higher incidence (approximately 30 in 100,000, though it has recently been declining) in China than in the U.S. (<5 per 100,000). In China, gastric cancer is the third leading cause of cancer-related deaths.

[4] Lymph node removal: the suffix *-ectomy* means to cut away, thus "lymphaden-ectomy" means to cut away lymph nodes. Lymph nodes are removed both so that pathologists can examine each lymph node to determine whether and if so, how far a cancer has spread, so that if there is cancer in the lymph nodes, that maximal cancer cells can be removed during this surgery (see note 1).

[5] I often heard the term "Western" (*xi fang*) in reference to "Western" countries (*xi fang guo jia*). I use this here as my interlocutors used it: to broadly describe an implicit "other" to China, rather than to reproduce an old and problematic East-West dichotomy which presumes cultural attributes to the "East" or "West." I use "Western" when my interlocuters use it as such (e.g., to describe "Western" medicine (*xi yi*) in contrast to Chinese medicine (*zhong yi*). Generally, I use biomedicine (rather than Western medicine, contemporary medicine, or modern medicine) (Lock and Gordon 1988), as these practices, technologies and knowledges of biomedicine are not limited to the canonical "West." I use "Western" only when it serves to indicate a dichotomy which is being drawn by my interlocutors, who themselves mean to communicate a difference or division between China and "the West," with regard to systems of knowledge making(Ong 2016:xvii). My intention is not to reproduce classic East/West, tradition/modern, national/transnational dichotomies (Fan 2007:526), but rather to use language in a way that represents the habits and speech of my interlocutors.

He asked his boss whether I could join them in the operating room, the boss acquiesced, and a few hours later, I was standing in sterile gown and gloves, huddled around the operating table, holding a patient's peristalsing bowels, feeling the hardened mass of a tumor, its foreignness obvious to even a novice like me.

In that moment, I felt the thrill of surgery, an unparallel sense of tactile presence with a patient's body, and a sense of longing to belong in this world. At the same time, I experienced the intimacy of the operating room: as part of this "inside circle" (by physical proximity, if not otherwise), I heard the quiet murmurs between trainees and their superiors, observed the flickers of frustration that knitted together brows, and took mental note of the complaining, the exaltations, and the gossip that provided an inside take on a world I had been trying to understand. More than any previous interviews I had conducted with patients, their families, nurses, resident physicians, or administrators, the operating room provided an unfiltered look beneath the skin, into the bowels of China's healthcare system.

That first operating room was at one of China's top hospitals for gastrointestinal cancer surgery and research. Though it would take years to articulate, my experience there sparked a curiosity that gave birth to the questions that drive this dissertation: what do China's operating rooms and expert surgeons teach us about China today? How have the rapid social, economic, and political changes occurring in Chinese society shaped surgical training and surgical practice? How does the knowledge required for highly technical biomedical practice like surgery travel across geographic and cultural boundaries and what does this mean for global scientific and medical practices?

In the process of researching this dissertation, I got a medical degree, decided to pursue surgery as a clinical career, and got a PhD in medical anthropology. Being a medical student and surgical trainee gave me access to China's operating rooms, to surgeons, to surgical researchers, and to inner sanctums and private conversations between professionals. Though all of the clinicians I worked with or interviewed during my fieldwork knew that I was conducting anthropological research and writing a dissertation, they seemed uninterested in this fact, and rather saw me as a surgical trainee and treated me as a surgical trainee as long as I acted like a surgical trainee. I was happy to play the part: I dressed in scrubs, went to morning report, walked amongst the trainees at the back of the crowd during morning rounds, and spent my days in the operating suites, retracting, occasionally suturing, and taking in the world around me.

In many ways, being a medical trainee at a top academic hospital in China felt like being a medical trainee in a top academic hospital in the United States. The rituals of surgery, changing into stiff, unflattering scrubs, "scrubbing" in at large metal sinks, standing on metal steps to match the height of the (always) male surgeons and surgical trainees around me, the banter between scrub-nurse and surgical resident, the banality of writing notes and doing post-op checks, the physical exhaustion and sugary drinks of late nights, the claustrophobic stress of being locked in stairwells because my badge failed: it all felt familiar.

In fact, the operations themselves often appeared interchangeable – the surgical instruments often went by transliterated English names (even if you understood no Mandarin, you could pick out "Kelly!" or "Allis!" being called out), and each operation followed the same standardized steps outlined in any surgical atlas. When my American surgical mentors and colleagues asked how the operations in China were different, I often retorted that they could teleport in, and despite the language barrier, easily complete any surgical operation. It would be a wordless dance, but it would be a familiar one.

When I felt homesick in China, unaccustomed to living in a city, being away from family or friends, I went to the operating room. I stood quietly and listened, felt the familiar ache in the muscles of my lower back and in the weight of my heel, found comfort in the familiar hum of the operating room, in anticipating the movement of instruments in the operative field, in quietly performing the familiar functions of a surgical trainee – retracting, suctioning, cutting sutures, retracting more. The hours spent in the operating room provided me comfort, but they also gave me clout: attending surgeons took a liking to the visiting student who was willing to stay late or to come in on weekends to drive the laparoscopic camera, and who asked questions about their technical approaches and their training.

I arrived in China for a period of dedicated fieldwork in spring of 2019, just as additional tariffs and restrictions were declared amidst an escalating trade war between the United States and China. I read news reports of Chinese-born scientists being extradited from America and of American scientists with Chinese financial ties being indicted amidst worsening political tensions. I worried the same might occur in China, that my work could be seen as some form of betrayal (or, even more unlikely, espionage). Despite my discomfort, I rationalized that I was merely there to observe and understand and tried to make sure that nothing I did could be construed as politically complicated. I felt uncomfortable because I knew, especially given my hyphenated identity as a Chinese-American, what I was being granted was rare: the trust of those around me to be present, to observe, to participate, to learn, to try to understand.

My fieldwork terminated suddenly with the advent of the COVID-19 pandemic and my forced evacuation. Flights in and out of China were cancelled, borders closed, visas suspended. Borders remain closed now; and even now, my ten-year visa to China has been rendered invalid. While certainly some significant proportion of the need for closed borders is due to ongoing risk of infectious spread, I also believe the pandemic provided cover for an existing trend. The months and years that followed saw less collaboration between China and the global scientific community, communication challenging, if not discouraged.

This dissertation therefore captures a moment inside China, before the close. Despite all the similarities which drew me continuously back to the operating room, this dissertation looks at how surgery in China is *different* and why that difference matters: how the operating room operates differently (and operates difference), how the systems of training and medical systems shape surgical practice, and what this means for China, for surgery, and for the global production of scientific knowledge.

### *Biomedicine, Sovereignty, and Modernity in China*

> The most important value of the scientific spirit is … love of their homeland and commitment to serving the people: integrating one's personal scientific pursuits into the greater project of rejuvenating the Chinese nation.[6]
>
> A Chinese Academy of Science Memo, January 2022

With China's economic and geopolitical growth, rapid urbanization and privatization, and the individualization and professionalization of the middle class since the 1990s, there has been a subsequent remaking of the Chinese "modern self." Kleinman et al. (2011) portray this "new

[6]新时代科学家精神的重要价值，就是鼓舞当代科技工作者继承和发扬老一辈科学家胸怀祖国、服务人民的优秀品质，主动肩负起历史重任，把个人的科学追求融入中华民族伟大复兴的事业中去。(Pan 2022)

Chinese person" as undergoing a shift in new life aspirations, navigating new societal inequities, and forming new social relations. The normalization of pursuing individual prosperity and happiness contrasts with previous cultural emphasis on self-sacrifice and self-discipline for the sake of a larger community (Kleinman et al. 2011:16; Rofel 2007; Zhang and Ong 2008).

However, amidst this shift towards privatization and a focus towards the individual, there is perhaps a second shift, with Chinese individuals' life purposes entangled in a larger question of what it means to be Chinese, and for those whose life purpose are science and biomedicine, what science and biomedicine means to China.

As Pan calls for in his speech to the Chinese Academy of Science, the success and prosperity of individuals is part of and necessary for the success and prosperity of the nation. Amidst a narrative of budding individualism in scientific and biomedical pursuits, there is a reminder that science may not have boundaries, but a scientist belongs to the nation.[7]

In China, the ties between modernity, biomedicine,[8] and sovereignty are historically embedded.[9] The earliest record of biomedical practices introduced to China are from the early 1800s, when missionaries like Dr. Pearson (a senior surgeon of the East India Company) introduced smallpox vaccines in China in 1805 (Fu 2013), or in 1834, when Peter Parker, the first medical missionary in China,[10] founded the Canton Missionary Hospital in Guangzhou (Unschuld 1988). Early medical missionaries saw the distribution of vaccine or of biomedical care as a way of building rapport with Chinese people.[11] Though missionaries were previously restricted to certain cities, China's resounding defeat during the Opium War and the resulting Treaty of Tianjin (1858) forced China to open ports to trade, military, missionary, and medical presence from multiple foreign powers (Wong and Wu 1936): by 1889, there were over sixty missionary hospitals in China (Unschuld 1988:239).

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[7] 科学无国界，科学家有祖国。

[8] Biomedicine describes the body of medical knowledge, medical research, and medical practice (and the necessary systems of infrastructure and beliefs) which has become the dominant form of medicine since the 20th century. Biomedicine includes an understanding of molecular life, a desire to optimize individual and collective health, and a subjectification via 'biological citizenship' (Rose 2006). Others have examined the social and cultural constructions of biomedicine, as well as how such knowledge came to be privileged and understood to be "universal" and "de-political" (Habermas 1971; Zola 1972; Kleinman 1980; Wright 1982; Lock and Gordon 1988; Latour 1988; Latour, Woolgar, and Salk 1986), and thus this text does not attempt to cover the complex history and sociology of science, technology, and medicine and the social construction of biomedical knowledge.

[9] Biomedicine has existed as a shifting and produced entities in the minds of Chinese people and at the hands of the Chinese state (Wong and Wu 1936; Rogaski 2004; Needham, Gwei-Djen, and Sivin 2000; Leung 2009): biomedicine has at times been embedded within a push for Scientization (Wu 1959; Sivin 1982; Croizier 1968), a colonializing tool of Western actors (Unschuld 1988), a foil to reify and define Chinese medicine (Scheid 2002; Andrews 2015; Lei 2016), a means to fortify worker populations (Hillier and Jewell 2013), or an avenue to manifest Enlightenment optimism (Yang 1994).

[10] Perhaps of particular relevance to this text, Peter Parker was an ophthalmologist, who identified surgery as a particular weakness in China: "[surgical] diseases of the eye were selected as those the most common in China, and being a class in which the native practitioners are most impotent" (Stevens and Markwick 1896:121).

[11] Biomedicine was seen as a means to an end, to "introduce the Gospel of our saviour in place of the pitiable superstitions by which their minds are now governed" (TR Colledge, P Parker and EC Bridgman 1836 as quoted in Yong 1973). While Christianization as a project generally failed (with less than 1% of China converting to Christianty), the medical missionaries introduced biomedical concepts and techniques and build biomedical colleges which laid the foundation for biomedicine in China which continues today (Young 1973; Fu 2013; Balme 1921; Cheung and New 1985; Kerr 1887).

Not only did the Opium War allow medical missionaries to establish hospitals and medical schools in China, the humiliating military and political defeats spurred the narrative that China had failed in modernization, industrialization, and scientization,[12] and had subsequently fallen behind (*luo hou*) their contemporaries in thought and practice. While China was never formally the colony of any single nation, the presence of multiple competing foreign powers in China in the aftermath of the Opium War has often been described as a "semi-colonialism" (*ban zhimindi*) of China, and the sense of limited sovereignty and political weakness during this period shaped state priorities for subsequent decades.

Geopolitical defeats were seen as a state of pathology: China was labeled as the "sick man of East Asia" (*dongya bingfu*). Specifically, China's military defeats by Japan, a much smaller country and historically a vassal to China, prompted comparisons between the policies and principles governing the two countries. Those who criticized China's governance highlighted Japan's scientific and technological developments which had not occurred in China. Science (embodied by Mr. Science, *Sai xiansheng*), in the eyes of many intellectuals of the May Fourth movement (1919), was the promise of a better future; scientific backwardness was seen as one cause of China's failures.

The China Scientization Movement (1932) pushed for intellectual reform, touting the superiority of biomedical sciences and public health programs which were seen as foundational to the strength of Western nations and Japan (Unschuld 1988:246; Croizier 1968:60–67). Though historically medicine had never been the profession of choice for aspiring elites, Liang Qichao, Sun Yat-Sen, and other founding elites recognized the political power of medicine and pushed for Chinese youth to study medicine, science, and engineering abroad and to bring that knowledge back to China.[13] Rather than being a tool of imperialism or (semi) colonialism, biomedicine became a necessary tool of state building, and of developing and implementing scientific and objectively reproducible knowledge.

Thus, science and medicine have been integral to a narrative of modernity and a pursuit of strength and sovereignty in modern China, especially since Deng's "Reform and Opening Up" period (1978-1989) during which science and technology were promoted as the first of the "four modernizations" which would propel China to global prominence. To 'modernize' was not only to reject tradition, but to embrace technical reason. Rofel (1999) shows how in late 20th century China, modernity is not a unified discourse which arises from Europe, but rather exists as a "narrated imaginary…a story people tell themselves about themselves in relation to others" (Rofel 1999:13).[14] Chinese modernity emerges from a history of being excluded from a Eurocentric vision of modernity: as I discuss in later chapters, my interlocutors see China's modernity as evidence that they "didn't have to do it the Western way" (by which they mean, socialism (with Chinese characteristics) rather than capitalism, communism rather than democracy).

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[12] Though scientization was often the term used in intellectual papers in this era, "science" and "technology" were so frequently conflated that the two terms (science, *kexue* and technology, *jishu*) were and often continue to be combined into one phrase (*keji*) (Fairbank and Goldman 2006; Song 2017).

[13] Bridie Andrews noted that key Chinese revolutionaries studied biomedicine: Sun Yat-Sen was one of the first graduates of the Hong Kong College of Medicine in 1892; Lu Xun studied biomedicine in Japan and felt strongly that Japan's strength could in part be attributed to an earlier introduction of biomedicine (Andrews 2015; Ho 2015).

[14] This perspective of modernity as constructed imaginaries is shared by others (Ong 1997; Anderson 2016; Liu 1995; Yang 1996; Ong 1999) who recognize the role of imagination for both nation-states and transnational communities.

But amongst many meta-narratives of modernity, science and technology were considered fundamental to transforming and building industry and economy; having once been the reason for China's failure to modernize, they were now believed to be the necessary tools to reach that modernization. Thus, in the subsequent years since Deng's "Opening Up," science has remained both a top political goal and a *tool* to reach political goals. This abbreviated synopsis glosses over many nuances of the role of science, technology, and medicine in modern China[15]: this section merely provides a brief overview of the lead-up to current day China, which has been described as a "virtual technocracy" run by engineer-politicians (Li 2016; Greenhalgh and Zhang 2020). China's present-day growth in global rankings or government investments in research and development reflect this claim.[16]

While historically there was a propagandized belief that science would *save* the nation (*kexue jiuguo*), this phrase has now transformed to reflect a continued belief in the importance of science in nation-building: policies and propaganda reflect the idea that science can strengthen (*qiang guo*) and rejuvenate (*xing guo*) the nation.[17] The ambition or aspirations of national rejuvenation is both in service of an internal strength and resilience, and an external display of exceptionalism. As discussed in later chapters, the collective and political memory of historical shames produces a need to be strong such that China will never again be bullied or seen as a "sick man."

Thus, China's historical and political circumstances provide ideal example of the *co-constitution* or *co-production* of science and society over the past century.[18] In the chapters that follow, this dissertation specifically examines surgical practice in China as example of both technonationalism and sociotechnical imaginary. Technonationalism[19] provides a framework for

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[15] Many historians of science have written on the role of science, technology, and medicine in China, from late Qing Dynasty, through the civil war, founding of the Peoples Republic of China, Great Leap Forward, Deng's Four Modernizations, through the present (Elman 2006; Elman 2009; Wei and Brock 2013; Lei 2016; Fang 2015; Unschuld 1988; Tsu and Elman 2014). This is only a brief overview.

[16] The Chinese Communist Party (CCP) has indicated their goal for China to be the "most technologically innovative nation" by 2020 and a global science and technology powerhouse by 2050. Its investments match these goals. China is second only to the United States in number of scientific publications (Cao and Suttmeier 2017; Xie and Freeman 2019), a benchmark China reached in 2014 (Xie, Zhang, and Lai 2014)

[17] Science is, of course, part of Xi Jinping's "China Dream" (*Zhongguo meng*). The "China Dream" has been the slogan of X Jinping since he became leader of the CCP; most succinctly, the dream is for the rejuvenation of the Chinese nation (*zhonghua minzu weida fuxing*). The Chinese dream encompasses strengthening the country, reviving the nation, and blessing the people (*guojiafuqiang, minzufuxing, renminxingfu*). Part of the China Dream is the "Health China 2030" initiative which was launched in 2016 with the principles of health and policy priority, innovation, scientific development, and justice (Tan, Liu, and Shao 2017; China Daily 2019).

[18] Jasanoff introduces the idea of "co-production," the idea that science and scientific knowledge "embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments, and institutions – in short, in all of the building blocks of what we term the *social*" (Jasanoff 2004:3). This idea of co-production is central to the field of Science and Technology Studies (STS) which explores how scientific knowledge is produced, structured, practiced, and transformed, refusing the concept of science as a static, pure, mirror of reality. This dissertation explores many of the themes of STS, attempting to understand the standardization (or attempts of standardization) of knowledge and practice (Daston 2000; Latour 1993; Pickering 1995), resolution of conflicts (Latour, Woolgar, and Salk 1986; Kuhn 1996; Shapin and Schaffer 1985), and the transformation and enculturation of scientific knowledges and practices (Traweek 1988; Rabinow 1997).

[19] "Technonationalism" is a phrase first used by Robert Reich to describe the link between technological capacity and a nation's security, economic prosperity, and social stability (Reich 1987). Reich saw the rise of techno-nationalism as in response to a recognition that investment in science and technology (and the smooth integration and development of science and technology) was necessary for "continued economic prosperity and military security" (Reich 1987:69). Ibata-Arens explores how China and India have developed a new form of "networked

seeing how science and technologies become and are enforced as state priority, as a tool to solve collective problems (Ong and Chen 2010:8); sociotechnical imaginaries[20] shape the advancement and transformation of science and technology on a global scale. That is, understanding how Chinese surgeons practice and understand surgery, as a form of technology and as a scientific knowledge, determines how surgery is transformed and what knowledges emerge.

The Chinese narrative of scientific and technological rejuvenation (*kexue xingguo*) connects the past with the present with the future: reinterpreting the past and projecting an expectation and hope for what might be accomplished. Individuals are shaped by these collective sociotechnical imaginaries: what is possible to do, to believe, to hope for, to perform. Thus, the development of surgical knowledge is not only in order to improve surgical practice and to provide better surgical care in China: it is an exercise of the power of scientific knowledge, an attempt to define what is true, what is real, and what is possible for China, and for surgery on a global scale.

***Surgery as a Tool of and Lens on the Nation***

> [New China hospital] strives to uphold the motto of the hospital – "Morals, distinction, knowledge, truth, innovation and excellence" by *serving its homeland and world* with selfless dedication… *establishing itself as an internationally acclaimed center of research and clinical excellence*.
>
> From the "Overview" page of the New China Hospital Website (emphasis mine).

For me and for many of my American mentors or colleagues, surgery is often framed as a calling, a personal commitment to a long and challenging training path: we are told that "if you can imagine doing anything other than surgery, do that other thing."[21] The implication is that the path to being a good surgeon involves innumerable sacrifices: you must love it to do what it takes to be good. In this dissertation, I propose that in China, the surgical calling is not (just) a personal one. In China, surgeons strive to be "a cut above" not just for personal success, but to further a narrative of China's technological, technical, and scientific modernity and strength. This is not just an anthropological observation, but a narrative explicitly stated through state memos, political speeches, and everyday social media. To be a doctor, to be a scientist, to be Chinese, is to serve China by striving for excellence.

Surgery (surgical practice, surgical research, surgical training, or the entire surgical enterprise) is one of many tools which are now in service of the nation, attempting to prove something about China's strength and growth in this new age. Surgery, as a technology,

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technonationalism" which harnesses nationalistic global diasporas, and cautiously manages an openness that transcends national borders, especially in the biomedical industry (Ibata-Arens 2019).

[20] Jasanoff and Kim define *sociotechnical imaginaries* as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, as in science and technology" (Jasanoff and Kim 2015:4). This concept allows for an understanding of how sociotechnical outcomes differ in different contexts (as shaped by preexisting imaginaries), how imaginaries channel the spread of technology (creating networks but also blocking flows), and how collective imaginaries interact with individual identities.

[21] This is, itself, problematic: the call for immeasurable sacrifice not for a job but for a personal mission has led to the collective burn-out of the medical profession.

represents a pinnacle of modernity[22]: to practice surgery, one must have access to "staff, stuff, space, system, support"[23]: buildings and spaces (modern hospitals, operating suites, post-operative care units), to devices and machines (diagnostic imaging, oxygen and anesthesia machines, surgical instruments), to processes (autoclave and aseptic processes, consent processes, accreditation processes), and to people (trained and certified surgeons, anesthesiologists, nurses, among others).

While my ethnography begins in the operating room, it extends outwards, to consider the specific configuration of technology, expertise, structures, systems, and ethical or moral norms which come together. Thus, this ethnography draws heavily on Collier and Ong's concept of *global assemblage* to consider not only how surgical practice takes place in the particular context of tertiary academic hospitals in China, but also how global knowledge emerges from this particular context, and the barriers to how that knowledge is shared and circulated, and how that knowledge might be operationalized.

Surgery is both a mobile technology, able to performed in any operating room, and a technology which is defined and limited by flows of knowledge and information transfer, migration of experts or devices, and changes in norms, morals, and ethics. What makes a "good surgeon" determines what surgeries can be done; what constitutes surgical knowledge determines what aspects of a surgery deserve to travel beyond a particular context. This approach to surgery as an object of inquiry provides a different framing of 'global surgery'[24] to consider not just the challenges of global surgical practice and health-system support, but the challenges of global knowledge production.

The success of surgery and surgeons at the top academic medical hospitals in China requires the modernization and strength of hospital systems, of research networks, of training programs, of biomedical industries. I show, in the following chapters of this dissertation, that the endeavors to legitimize, showcase, and prove China's distinction in and beyond the surgical field shape surgical practice in China. Dr. He's comment that I had probably never seen a D2 gastrectomy was one example of a focus on China's difference, a comment comparing China that would later be echoed by him in his lectures at conferences on the superiority of China's surgical approach to gastric cancer. China's focus on difference conveys a pluperfect and implicit

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[22] Surgery has not always been associated with modernity: surgeons were once more associated with butchers and manual workers than they were with technique and elite training. The historical transformation of "modern surgery" required medical and scientific revolutions on germ theory and anesthesia, as well as organized forms of socialization and professionalization which distinguish those who with intellectual and technical mastery from those without, and has been covered by many others and will not be covered in this text (Kuhn 1996; Schlich 2007; Fitzharris 2017; Brown 2017; Rutkow 2022).

[23] The "Five S's" is a framework which assesses the components of a strong health system needed for (global) health-care delivery, shifting from a disease-focused (e.g., the goal of eradicating malaria or tuberculosis) to a systems focus (creating strong health systems that can deliver improved outcomes for various diseases and conditions)(Kim, Farmer, and Porter 2013). The Five S's refer to Staff (well-trained and sufficient numbers of nurses, physicians, pharmacists, and other necessary people), Stuff (tools, resources, materials for care delivery), Space (hospitals, clinics, specific care units, or other appropriate spaces to deliver care), Systems (leadership, governance, financing, or information systems), and Social Support(Strong Health Systems n.d.; Aurora Prize 2022).

[24] Global surgery is a relatively new academic field, though its foundations can be seen in the faith-based or humanitarian missions which conducted surgery in low-resource settings and were short-term in their scope and practice. Global surgery as an academic field often describes the research and support of surgeons from high income countries conducting surgery or supporting surgical practice in low- and middle-income countries. Most recently, the Lancet Commission on Global Surgery (Meara et al. 2015) has shaped much of the academic dialogue in presenting a health-systems approach, promoting regionalized plans and standardized collection of data (Bowder, Alayande, and Fowler 2022; Bath, Bashford, and Fitzgerald 2019; Dare et al. 2014).

sameness: that in order to have surpassed the "Western" biomedical sciences, they must have, at some point, *already been as good as*. To "catch up" or imitate was no longer the *modus operandi*; they were now seeking to do something distinct, Chinese, better.

In the past, ethnographies of biomedicine in contemporary China have framed China's biotechnology and medical sciences as undergoing a process of catching up or adapting 'Western' practices and technologies to Chinese contexts.[25] Yet more recently, Chinese physicians and scientists are attempting to push the boundaries and innovate at the cutting edge, responding to national narratives which call for *innovation* rather than replication:

> "Scientist in this new era must strive to bridge the gap from "following" (*gen pao*, running behind) and "collaborating" (*bing pao,* running alongside) to "leading" (*ling pao*, setting the pace), such that we can securely grasp key technologies within our own hands." (Pan 2022)

Recent ethnographies highlight this trend: BGI Genomics, housed in Shenzhen since 2009, is now the largest genome sequencing center in the world, and sees itself as a disrupter of global scientific knowledge production (Ong 2016:203). The CPP's push for scientific and technological modernization (*kexue jishu xiandaihua*) and new forms of global communication allowed for experimental fetal stem cell therapies targeted to foreign patients (Song 2017). This dissertation build's on Song's provocation that "science and technology is not just a strategy for individual triumph but as a broader cultural mandate for national salvation" (Song 2020:69; Song 2017:107).

However, China's modernization and scientization ventures are not without challenge. Greenhalgh and Zhang's edited volume and Li and Shapiro's 2020 volume on China's 'environmental authoritarianism' paint a bleak picture of the reality of the Chinese dreams for scientific and technological rejuvenation of the nation, highlighting the "gap between the promises delivered by the party and the frustrations of ordinary people" (Greenhalgh and Zhang 2020:18). Mason describes the tensions created in the professionalization of China's public health departments, which simultaneously is tasked with "serving the people," meeting metrics of scientific productivity, and shouldering civic responsibilities amidst global pandemics (Mason 2016).

In the chapters that follow, we follow a group of expert Chinese surgeons who are not trying to 'catch up' with regards to technological expertise or knowledge, but who propose that by 'Western' standards of excellence, they are already better. By making this claim, they propose that they have already, in a no-longer-important-past, caught up. These claims are in service of a pervasive national dialogue, as described by Song 2017, and are challenged by geopolitical

[25] Early medical anthropology of China uses China as a medical pluralism foil for the hegemony of biomedical knowledge (Leslie 1977; Kleinman 1980; Kuriyama 2002); the study of the clinical encounter of Chinese medicine began a conversation of how notions of the body are embedded in the culture and society that surround it (Farquhar 1994), a conversation which was taken up by a significant body of work charting interactions between the body and the Chinese state, whether vis-à-vis the impact of globalization on border-regions (Liu 2010) or the stigmatization of HIV/AIDS (Hyde 2007) or of mental illness (Guo and Kleinman 2011; Guo 2016), the social, political and legal identity of people living with disabilities (Kohrman 2005), or the formation of a new understanding of self amidst a changing political landscape (Kleinman et al. 2011). The "psychic-boom" in China has been particularly attended to, tracing how psychiatry interrelates within China's social and political contexts, whether with regard to clinical psychiatry, qigong practices, or popular psychotherapy (Kleinman et al. 2011; Chen 2003; Zhang 2020).

tensions which exacerbate tensions between Chinese scholars and the "transnational scientific common" described by Mason (2016). In doing so, I challenge the idea that biomedical and scientific knowledge produced or developed outside of the "West" should be or desires to be subsumed within these "transnational scientific commons." As Ong argues in both *Fungible Life* and in later lectures, the multi-sited development of technologies such as surgery "add complexity to what universality in science means" (Ong 2020:1)

### *Where and When and How*

This dissertation is based on eight years of ethnographic research spanning from 2012 to 2020, with a year of sustained fieldwork leading up to the start of the COVID-19 pandemic which forced me to leave China. In the initial years of my ethnographic research, I visited multiple academic hospital sites, ultimately choosing to conduct my research at "New China Hospital"[26] in a non-coastal major urban city, which I will call "Valley City."[27]

In the courtyard of New China Hospital, a gnarled tree sits by the entrance to the main building. It is unusual to see older trees in this city: only a few are preserved in temples or shrines which have been afforded protection from the constant razing and rebuilding of towering steel structures and highways. This tree is the only visible sign that this hospital campus has not moved in the century since its founding: the thick, gnarled branches extend outwards from its base, their smooth, bark-less surfaces creating a wide penumbra. Hundreds of red silk ribbons are tied on each branch, each one secured by a patient or family wishing for health, and on a gentle spring or autumn day, the ribbons dance in the wind.

The tree sits at the edge of a small central garden, through which a path winds, shaded by vine-covered pergolas. Along the pathway, benches are dotted with family members, taking a break from waiting nervously inside to wait nervously outside; patients still in hospital gowns rest on the benches as they sneak a smoke. Beside the path, someone has set up an ad-hoc barber station, offering haircuts for patients and family members who cannot leave the hospital campus, or most commonly, full shaves for those who are asked to shave off their hair prior to brain surgery.

Above the central gardens, several buildings tower: most proximately to the Tree of Red Ribbons, the main building, which houses the outpatient clinics and is connected to the No. 1 inpatient building. No. 2 inpatient building towers even higher, attached to No. 1 by several sky-bridges. Within No. 2, three floors of operating suites house over a hundred operating rooms,

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[26] The name of this hospital, and all its affiliate hospitals, as well as the names of the surgeon and surgical trainee interlocutors are pseudonyms to protect their identity, and to protect my relationship with them. I was explicit with all my interlocuters that I was working on a dissertation (and later, a book) on surgery in China. They were often excited about this project, hoping that I would serve as a translator between two worlds. Though those who I interviewed for this dissertation all spoke to me willingly and excitedly, I was often nervous about getting things wrong or representing the hospital in a way which would make return visits unlikely. Like others who have written about China recently, I am aware of censorship of researchers, writers, journalists, and anthropologists working in these regions. While those familiar with China and with China's medical system could likely determine the identities of the hospital where I conducted my fieldwork, and possibly some of the individuals who I interviewed, I have done my best to change identifying characteristics to protect these individuals as well as myself.

[27] Due to the nature of China's hospital rankings, divulging the location of the hospital would allow the reader to easily determine the identity of the hospital (just as if I mentioned a "famous hospital located in Minnesota," those in the U.S. medical field would immediately think of the Mayo Clinic. Regardless, attempts to obscure the location of my fieldwork may be unproductive, as most of China's top academic hospitals are in the large, coastal cities, often collectively referred to as "*bei shang guang*" (referring to Beijing, Shanghai, Guangzhou/Shenzhen).

where I am told, nearly 200,000 operations were conducted the year prior. The elevator manager tells me this figure as he lets me out at the entrance of the operating suites and wonders aloud if this is the year that they will top 200,000.

New China Hospital is a highly ranked academic tertiary hospital, well regarded not only in its region, but nationwide. Like many of the older academic tertiary hospitals, New China Hospital was founded in the late 1800s by Christian missionaries from the United States, Canada, and the United Kingdom. In the early 1900s, New China Hospital's affiliate medical school was founded, making it one of the earliest schools of "Western Medicine" in China. In the century since its founding, New China Hospital grew to become one of the largest hospitals, with over four-thousand hospital beds. But beyond mere size, it has also grown in reputation. In the last several decades, New China Hospital has risen significantly in hospital rankings, partly due to its hospital volume, and partly due to its research productivity. For the past decade, it has consistently ranked in the top five hospitals in China and ranked first for producing "high quality research articles," a position they are eager to defend.

The ranking and reputation of New China Hospital are reflected in the wide red banners which adorn the sides of the main building, or the laminated and oversized print-out of each department's ranking on the posterboards adorning the pathways. Patients flock to this hospital, not just from this province, but from many of the neighboring provinces, to seek care from experts whose bios, flashed on LED screens and erected on posterboards outside of their clinics, list their degrees and accolades, as well as the international journals in which they have published.

While New China Hospital is known as an all-around top academic hospital, it is known especially for its anesthesia department and Oral and Maxillofacial surgery (informally, *kou qiang ke*): thus, its operating rooms train many of the region's surgeons, anesthesiologists and nursing staff, and short-term and long-term visitors in the operating room are common. I was told that even amongst the undergraduates, one fifth of each class were international students, often from Nepal, India, or Pakistan, whose classes were wholly taught in English. My presence as just another foreign visiting student was thus rarely noted; eventually, I out-lasted most rotating students, and the surgical trainees and attendings came to see me as a fixed member of their clinical and research teams.

I had first traveled to this province in 2003, and again in 2008, when I had lived there for a year, teaching English to displaced elementary school students and picking up phrases of the regional dialect. I was lucky that I already spoke, read, and wrote Mandarin fluently. Though I was not fluent in the regional dialect, I could understand casual conversations well enough. My new colleagues were surprised and grateful that I understood them, such that they did not have to speak the formal and forced Beijing dialect (*putonghua*) which made everything sound like a presentation. Their faces relaxed when I nodded in understanding, though often I had to listen and re-listen to recordings to understand the meaning of certain phrases.

I was also aided by personal connections. One of the junior attending surgeons was a former classmate of a good friend of mine, a surgeon in a different department; and halfway through my fieldwork, I found out the Chair of the department was a childhood friend of my friend's father – by that point, making this connection only meant he would occasionally call me out by name during morning report, something that never failed to make me blush. While I had expected that my American "brand-name" (*meiguo mingpai*) education would have provided some degree of legitimacy, they were unimpressed by my pedigree and preferred to share that I had once published in the *Lancet*, a well-regarded and top ranked medical journal.

My ethnographic research at New China Hospital included participant observation, as I embedded myself within the Department of Gastrointestinal Surgery, formal and informal interviews, and analysis of various documents, including visual media around the hospital and social media posted on the hospital's Weixin or Weibo accounts.[28] My time at New China Hospital was at first spent predominantly in the operating rooms, and I followed the routines of the trainees and chief residents. My day started with morning report, rounding with the team, hurrying to the operating rooms, scrubbing in for the day of cases (sometimes two, sometimes more, each three to five hours long), breaking scrub mid-day to eat lunch in the operating room suite canteens. Occasionally in the afternoons I would join their weekly tumor board meeting or other research meetings; if there were not operations scheduled or if there were enough people in the operating rooms, I would work in an office shared by four junior attendings, rotating to sit at the desk of whoever was operating that day. Sometimes, I stayed late for call nights, joining chief residents for urgent surgeries in the operating suites which abutted the emergency department.

As these attending surgeons came to understand my project, they began to send me talks or conferences that might interest me, as well as welcoming me along for their clinic days or their days at affiliate hospitals. Thus, my research expanded beyond the operating room, beyond operative techniques and operative training. "Surgical practice" (as I have come to understand it) describes what is done in the field of surgery: this includes not just the application of surgical techniques by surgeons in operating rooms, but also the pre-operative conversations about the risks and benefits of surgery, the conference rooms which discuss cutting-edge research and the results of new clinical trials, the policy documents which shape which hospitals will be reimbursed for which surgeries.

While this is not a dissertation about the COVID-19 pandemic and China's handling of the pandemic, I would be remiss to omit this significant event, which also had a significant effect on the materials gathered for this dissertation. I was not able to complete my fieldwork as intended: I had scheduled many of my formal interviews with key interlocutors for after the Chinese New Year in 2020; two days before the new year holiday, the city went into lockdown. Several weeks later, I was asked to evacuate, as I was in China as a Fulbright scholar.

Writing in the aftermath of my evacuation, as the COVID-19 pandemic continued to spread throughout the world, the events of the pandemic only served to clarify my perspective on my research. First, that as I had seen over the course of my fieldwork, healthcare – especially as delivered in high-tech tertiary care hospitals – was political. The strength of a country was reflected by the ability for a country to handle a pandemic, to produce a viral genome sequence, to publish evidence on how to treat or ameliorate those stricken with COVID-19. Second, that there was limited understanding of China's healthcare system outside of China: that this dissertation, an insider's, on-the-ground account of an academic tertiary care hospital could provide an account of the unfamiliar.

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[28] *Weixin* (WeChat) has been described as akin to China's Facebook, though it has expanded far beyond the reach of Facebook in the U.S.: in China, almost all communication happens via Weixin (chat, voice memos, phone calls), such that I did not have the cell-phone numbers of even my closest friends the entire time I was in China. Weixin, like Facebook, also includes a "feed" where people post photos, thoughts, links, and videos. Crucial to daily living in China, WeChat Pay has become the ubiquitous way of payment, making cash and card virtually obsolete in China. *Weibo* has been likened to Twitter, Instagram, or other social media micro-blogging platforms.

**Organization of Chapters**

This dissertation examines cancer surgery at one of the top academic hospitals in China during a period of significant healthcare reform and geopolitical tensions. The chapters that follow provide in-depth ethnography on the lived experiences of the surgeons and surgical trainees who experience these tensions and strains. As described in this introduction, surgery in China is a technology and performance of technonationalism, and the embeddedness of surgery amongst complex political, financial, and social drivers transforms the practice of surgery in China.

I propose that the distinction and strength of Chinese surgery as claimed by Chinese scholars and surgeons themselves rely on numbers and narratives to legitimize certain forms of knowledge. In Chapter One, "Operating Room: Differences & Standards," I describe the operating room as a training ground, focusing on the challenges of standardization and surgical practice as a space of distinction. I examine the role that numbers play in defining difference: an obsession with numbers which seemed to permeate every conversation (bed counts of hospitals, money invested in building a new hospital wing, numbers of operations per year, etc.). Operative volume allows for clinical diversity which results in versatility and expertise for surgical trainees.

In Chapter Two, "The Life Cycle of Numbers," I examine how the rise of data-driven medicine shifts traditional apprentice-models of training and how the creation of patient databases impacts clinical practice and the conceptualization and morals of clinical care. While volume has always been crucial for the training of individual surgeons and their teams, the push to "data-fy" patients transforms operative volume into numbers which can be used to prove the success of an institution or a nation.

Chapter Three ("Ties That Bind") focuses on the growing biomedical research apparatus in China and how research serves as a form of comparative practice and a forum for distinction on a global stage. Like Chapters One and Two, this chapter looks also how numbers and metrics have shifted research practices and incentives, standardization as a form of integration within a global scientific community, and the politicization of research within an ethos of technonationalism. This chapter introduces the tensions between a desire to be self-sufficient and a sense of reliance on external (non-Chinese) actors and institutions for validation and acceptance, and how healthcare reforms and changes in institutional and state guidelines have sought to bolster, strengthen, and promote Chinese biomedical research.

Thus, drawing on a long history of medical anthropologists in China who have studied the intersection of patient care, medical and scientific governance, and social moral worlds, this dissertation examines surgical practice within a certain moment of healthcare reforms, attending to surgical practice a moment of significant tension and change. Within the context of escalating U.S.-China tensions, Chinese scholars have called for and began enacting an *academic* "decoupling." If national security depends on technological and intellectual self-sufficiency, de-coupling seems to be one of several possibilities.

In Chapter Four, "Circles of Influence," I examine the push to standardize within the narrative of technonationalism, and the logics and ethic of standardization, considering China's healthcare reforms over the past ten years which seek to strengthen healthcare and elevate the standard of care for patients and standard of research and knowledge production for physicians. In this chapter, I delve into the lived experience of a divided self: a personal interest centered on family, relationships, and personal fulfillment, and the interests of the institution and nation.

While Chapter Four describes the physical and moral distress of a divided self in the form of a surgeon-administrator, Chapter Five ("Flying Knives") explores how local forms of moral meaning are made as surgeons pursue professional freedom and "domestic humanitarianism" through not-quite-legal consult surgeries. While healthcare reforms have attempted to address social unrest and access inequality, the movement of physicians throughout China's medical alliances indicates a boundlessness of a national techno-imaginary. This boot-strapped decoupling embodies a sentiment that "we can do this ourselves," each disciplined and sacrificing individual surgeon strengthening China's medical care and research capacity without the need for help from others.

The dissertation concludes with an Epilogue, which describes a case of intra-operative death in an alliance hospital in America. The conflicts portrayed in the case parallel many of the conflicts described in previous chapters and make evident that the challenges of performing complex surgery, whether in the United States or China, are entangled in a complex network of financial pressures, political ideals, training opportunities, staffing structures, and individual morals and pride. The dissertation thus concludes considering the implications of an ethnography of surgery in understanding both the global challenges of surgical practice and in understanding China today.

## INTERSESSION: Operating Room as Home

In this "INTERSESSION," I introduce surgery as object, and set up the questions discussed in the following chapters. As a medical trainee, my access to surgery, whether in China or in America, is intimate: my "participant observation" was alongside surgical trainees, practicing as a surgical trainee, hearing the same sounds, feeling the same bowels, and striving for the same publications as the interlocutors whose interviews provided insight into these worlds. I am grateful, always, for this unprecedented access: the opportunity to *be* trained, to use my body as not only a lens into multiple worlds, but an instrument to experience and gauge various facets of the world.

My experiences as a surgical trainee shaped not only my interest in surgery as a space of anthropological inquiry but led me to see surgery as a global assemblage, a framework which shaped my analysis of surgical practice. In this "INTERSESSION," I discuss the experiences which led me to see surgery as a global assemblage: for me, experiencing surgical practice as an assemblage meant recognizing its multiplicity and its lines of flight (per Deleuze and Guattari) which guided each chapter of this project. What questions does the framework of global assemblage allow for? Specifically, how do global assemblages reframe comparisons?

My first experiences with surgery were not explained: there was no structure, no map or guidance. I was plopped in the middle of it all, to make sense of it myself. I could attend to the hands of the surgeons or the blood in the veins. I could listen to the conversations happening between nurses as they taught trainees the names of instruments or try to follow the organs on the laparoscopy screen as they connected to and abutted against each other. I experienced surgery without genealogy, without knowledge or memory of what surgery was before or what surgery would become (for myself and for the field). This is not to say that surgery can be ahistorical, or that I did not eventually strive to find structure in practice. However, the embodied nature of surgery prompted me recognize patterns which connected one operation to another, whether I was operating on a pig or a human, whether I was in China or America, whether I was standing on the left or on the right of the operating table.

I think my initial experiences in surgery in Guangzhou, not as a formal trainee, but just as a curious participant, allowed a closeness to the practice. I was not trying to make sense of it, but merely to be amidst it all. Later, as a medical student, I found I liked the way my mind felt in the operating room: alert and curious, with the rest of the world washing away as my mind's attention rested on the sensations immediately apparent to me. It felt reminiscent of my experiences living in a Buddhist monastery for three months between my first and second year of medical school. There, I had learned not only to sit in the meditation hall for ninety minutes at a time, four times a day, but to slow my steps, to find meditation as I walked through terraced tea-fields, feeling the ground beneath my feet, the slow transfer of weight from heel to ball to toe. There, the nuns taught me how to find meditation in the washing and chopping of vegetables, feeling the water on my fingers, and the texture of roots against my palm.

I find the operating room sacred in the same way I find the meditation hall so: it is a space dedicated to a practice, where certain things are left outside, and there is an expectation of cleanliness and purpose within. I like the divide between the operating suites and the rest of the hospital, the hallways and doorways one passes through, slowly leaving thoughts of other things behind. I find that operating means that my attention is drawn repeatedly to the field, that my

mind, should it wander, is brought back repeatedly by the sight of blood, by the feeling of persistent peristalsis beneath my fingers, by the smell of chlorhexadine, or cautery, or feces.

There are no doubt numerous differences between the experience of a patient in America undergoing surgery and a patient in China undergoing surgery, or differences between the Chinese insurance reimbursement system and the American payment system, yet I found myself drawn to the operating room for its sameness. Amidst the homesickness of being in a familiar-but-not-home city, surrounded by people I did not know or trust, I felt most at home in the operating room, where the sounds, smells, rhythms, and logics were familiar. I often felt that any of my American colleagues could walk into the operating rooms at my field-site, and even with no language skills or translator present, complete an operation with little difficulty. Given all of the differences in healthcare systems, cultures, languages, and patients, why was this so? What aspects of surgery remained durable in various geographic settings, resistant to transformation? What allowed for surgical practice to be global?

Surgery is a form of technoscience, and like other technologies of modernity, it attempts to achieve reproducibility and homogeneity across contexts, with established rituals, hierarchies, terminologies, and uniforms. In hospitals in California or Valley City, I experienced this homogeneity, performing the same rituals, wearing the uniform of baggy scrub-top and scrub-pants and sterile gown, feeling the same weariness in my feet after hours of standing, and drawing the same simple sketches of operating room layouts: rectangles for the operating table, scrub table, anesthesia cart and circles for the surgeons, trainees, scrub nurses, circulator nurses, anesthesiologists, and visitors.

My audio recordings from operations were material evidence of the homogeneity of technoscience. As an anthropologist conducting participant observation in operating rooms, I often relied on recordings to remember details. Before every operation, I would ask meekly whether it was okay for me to record. At first, I would make a variety of excuses and explanations: that I was learning and my language abilities, especially with academic and medical terminology was limited; that everything would be confidential, that I was not taking note of what anyone was saying specifically, recording just made it easier for me to take notes. No one ever seemed to care, or to take my excuses seriously. Eventually I stopped explaining and just asked permission, which I always received. The fellows recorded most of the surgeries anyway, multiple USBs plugged into the laparoscopic tower, a small red light flashing in the corner. “Do you want a copy?” They would ask me. They had amassed a library of surgical procedures on un-named and un-labeled colons and stomachs on their disk-drive, hundreds of files which contained pink fleshy bits passed between metal instruments. Never having the right dongle for my computer, I always shook my head.

On days when I scrubbed into operations, I would hit record on my phone, place it in the breast pocket of my scrub top, with the microphone facing out, and scrub in. Every recording starts with the sound of me dropping my phone into my pocket (the tell-tale rustling of cloth against the microphone), and then the steady few minutes of water splashing, the squeaking of skin against skin, bristles against skin, water against skin, as I washed my hands and fingers and arms and elbows alongside other trainees. I often forgot myself that I was recording, and much later, when I took my phone out when changing out of scrubs, would find I had a five-hour recording I knew I would probably never listen to.

Occasionally, when I scroll through these recordings, I find comfort in the constants: the slamming of my knee against the aluminum sink to turn off the faucet, the rustling and water

sounds. The footsteps, plastic slippers slapping against linoleum floors, the sound of a door sliding open, and then predictably, the sounds of entering an operating room: like when a symphony is warming up before the house lights fall, the sounds of things being moved, requests being made between people, counting of instruments, the banging and crashing as the last portion of the operating table are removed and stirrups are inserted and the patient's legs are moved in place and tied down. Underlying it all, the steady monotone and metronomic beep of an anesthesia monitoring machine.

For the first few months of fieldwork, the operating room was the only place I did not feel homesick. While I was still adjusting to the local dialect and often found myself lost in conversation, the sound of the operating room was easy to decipher, like familiar motifs by a composer I knew well. I played violin and in an orchestra for over a decade, and though I never formally learned music theory, I learned to recognize the sweeps and swells of symphonic masterpieces, the changes in rhythm which indicated a shift in tone, the chord progressions which heralded a variation on a theme.

I came to recognize the same forms in the sounds of the operating room. Boisterous laughter and shared complaints of shift schedules and long hours would slowly subside when the operation began, replaced with low volume chit-chat, punctuated by the occasional request of an instrument between the surgical team and the scrub nurses. Chit-chat would diminish, replaced by even quieter conversation about academic projects or post-operative patients when more senior surgeons joined, and when even that conversation gave way to silence, I knew the surgeons had embarked on a critical section of the operation.

The volume and cadence of conversation, regardless of its content, was only one thread of this soundscape. The beeping of monitors provided a constant metronome; under the watchful eye of the anesthesia team, it rarely rose or fell. The sound of tools provided an additional layer of sound – metal instruments being passed between multiple hands, the clamoring of retractors knocking against each other. The sound and smell of a bovey cutting through skin – both the hiss of the char and the steady beeeeep that indicates cautery – and the beep-beeeep of a ligature singing as it harmonically seals and cuts through vascularized tissue. The sucker provides tympanic warning – large volumes of blood moving through tubing has a distinctive and unforgettable sound: it is the sound of hemorrhage, and it is paired with silence, and the occasional curt command.

From sound alone, one can piece together how a surgery is going, and in an open surgery, if I could not see into the body cavity to follow along the operation, I would often sit on a step stool behind the large machines and towers and just listen to the sounds wash over me, getting up occasionally when it sounded like help was needed, to open another packet of sterile suture or another pair of gloves if the circulating nurse happened to have left the operating room to retrieve something from central supply. The soundscape guided me in California and guided me in China, the familiar swells and cadences providing the contextual clues I needed to stay grounded.

The sounds and embodied experiences became lines of flight, deterritorializing the assemblage of surgery, pushing me to attend not to a static, bounded form of surgery, but to its possibility, its capacity to point to other practices, other questions. They pushed me to allow my ethnography to wander and seep beyond the space of the operating room: to follow surgeons to other hospitals, to follow a number or Kaplan-Meier curve to conferences and libraries, to follow

the questions asked of me about America's medical training or the emotion that arises within me when asked a politically sensitive question.

Because my exposures to surgery occurred in both China and the United States, neither were the basis for the other, and I have always experienced surgery as a global assemblage (per Ong and Collier). In considering "global assemblages," global refers to the ability for forms of technoscience to transcend context: that as they develop, they aim to be able to move across contexts; assemblage refers to the specific iteration that global forms take. This dissertation takes surgery in China (and specifically, surgery at an academic tertiary institution in Western China) as a global assemblage: one iteration amongst a range of other iterations of surgical practice, rather than the transposition of or evolution from a "Western" (Euro-American) surgery. This disrupts the assumed narrative that surgery in China is modeled after or evolved from Euro-American surgery or that "global surgery" refers only to the practice of surgery in low-resource, non-Euro-American settings.

To consider surgery as a global form is to ask to what extent surgery, as a technoscience, reconstitutes society, culture, and the economy where it is situated. I seek to explore how surgery can be considered a global form, sitting within a nexus of other flows which dictate and disrupt the possibilities of forms it may take, and how it itself is in constant motion, affected by its own history and the uncertainty of its future. How does studying surgery as a global form help us understand how scientific and medical practices de-territorialize and reterritorialize?

Per Collier and Ong, global forms "code heterogeneous contexts and objects in terms that are amenable to control and valuation. At the same time, the conditions of possibility of this movement are complex. Global forms are limited or delimited by specific technical infrastructures, administrative apparatuses, or value regimes" (Collier and Ong 11). What are the infrastructures, apparatuses, and regimes which limit global surgical practice, and how do they shift in different contexts? As global forms are territorialized, "new material, collective, and discursive relationships" (Collier and Ong 4) take form.

Surgery at New China Hospital creates material, collective, and discursive relationships which differ from surgery territorialized elsewhere (elsewhere both in different provinces or in a different country), and which are defined by the infrastructure, apparatus, and regimes which limit and allow its form. The following chapters examine surgery at New China Hospital as a global assemblage, looking specifically at how new relationships within surgery form around training, metrics and evaluation, and productivity, as surgery at New China Hospital situates itself within an ever-reforming and transforming Chinese healthcare system and international scientific community.

### *Opening across assemblages*

The framework of global assemblage also provides opportunity to consider comparison in a different way. As a researcher in both China and the United States, I was often asked to provide comparison between the two countries, health systems, or surgical practices. Sometimes the questions were general ("what's it like over there?"), and sometimes quite specific ("how long do surgeons have to wait for operating room turnover? Frozen section?" or "is there systematic endoscopic screening? What about follow-up?"); either type of question often left me stumped. I had spent a lot of time at a very specific institution in China, and a very specific institution in the United States, and neither felt representative of all academic medical centers, much less healthcare systems writ large.

Even if I knew the answer to a question (e.g. operating room turnover time ranges from 30-60 minutes at any institution: surgeons at both institutions use the time to grab a bite or to round on patients or to finish some paperwork. Surgeons in China also use this time to smoke.), there was usually much more to the question or answer than a simple number. Even a straightforward number like operating room turnover time is part of a larger assemblage of workers, pay incentives, hospital regulations, institution or department specific culture, and availability of mops. Despite this, I understood the desire for simple comparisons, a chart comparing various aspects across two geographies. Numbers captured these comparisons readily, and Chapter Two focuses on the attraction of numbers to carry narratives of comparison and distinction.

Throughout my research and this project, I was drawn to these questions of comparisons and the differences that mattered to my interlocutors and how those comparisons and differences seemed to be part of larger narratives. What were the differences between American surgical practice (as I knew it) and Chinese surgical practice (as I knew it)? Even if simple comparisons could be made, each comparison was an invitation to explore the lines of flight that extended.

In America, surgical residents include relatively equal numbers of men and women. In China, all of the trainees and attending surgeons were men.

In America, surgical training is formalized and structured to include five to seven years of residency training, after which most surgeons perform full surgeries independently. In China, surgical training has undergone significant reform and is increasingly standardized, but is not yet fully formalized, and can take between three and ten years.

In America, surgeons sometimes play music in their operating rooms; in China, surgeons rarely listen to music while operating.

In America, operating rooms usually start their first cases at 7:00 AM. In China, the operating room start time is 9:00 AM.

In America, surgeons rarely scrub out to eat or use the restroom; in China, trainees often relieve each other around noon-time so that those scrubbed in can eat.

Each of these comparisons takes one unit of an assemblage to compare to an analogous unit of another assemblage, but this comparison does little to interpret or comprehend the assemblage itself. However, each unit provides entry-points into the assemblage, its interconnections, and therefore into larger conversations and more nuanced questions. While in the main chapters, I focus on the comparisons attended to by my interlocutors, interrogating how comparisons are mobilized within national, institutional, or personal narratives, here I provide two examples of how comparisons open up questions within a global assemblage. These comparisons also provide background information which is relevant and helpful for understanding the chapters which follow.

*On Surgical Training*

While the differences between the American surgical training system and the Chinese surgical training system cannot be easily described, some of its basic differences can be captured in a simple (though not quite accurate) chart. The medical education system in China has also undergone significant changes over the past decades, largely driven by political forces and changes in state priorities, and this chart does not capture the fact that there are many physicians in China who went through different training paths or the fact that these training paths continue to be under reform.

<table>
<tr><th></th><th colspan="2">Medical education</th><th colspan="2">Postgraduate education</th><th>CME</th></tr>
<tr><td rowspan="4">China</td><td colspan="2" rowspan="3">Bachelor program (5y)<br>(ben ke sheng)</td><td></td><td>Standardized residency training (SRT) (3-5y)</td><td rowspan="4">Standardized sub-specialty training (?y)</td><td rowspan="4">Career -long</td></tr>
<tr><td>Masters (3y)<br>(yanjiu sheng)</td><td>SRT (4y)</td></tr>
<tr><td>Masters (3y)</td><td>Doctorate (3y)<br>(boshi sheng)</td></tr>
<tr><td colspan="2">Bachelors + Masters combined program (7y)</td><td>Doctorate (3y)</td></tr>
<tr><td colspan="3">Bachelors+ Masters+ Doctorate combined program (8y)</td><td colspan="2"></td></tr>
<tr><td rowspan="3">USA</td><td rowspan="3">Bachelors (4y)</td><td>MD program (4y)</td><td colspan="2" rowspan="3">Residency (3-7y)</td><td rowspan="3">Fellowship (1-3y)</td><td rowspan="3">Career -long</td></tr>
<tr><td>DO program (4y)</td></tr>
<tr><td>MD/PhD program (8y)</td></tr>
</table>

**Table 1: Stages of medical education in China vs. U.S.**
CME = continuing medical education; SRT = standardized residency training; MD = medical doctor

This figure does not capture additional complexity in China's medical education system: nearly half of China's current physicians hold lower than a bachelor's degree, having earned their diplomas from vocational (*zhuan ke*) or secondary vocational schools (*zhong zhuan*) (Zhu, Li, and Chen 2016). Since masters or doctorate degrees can be research-focused degrees, obtained without undergoing clinical training, residency training aimed to ensure standardized clinical training (Lu and Fan 2008).

Medical education in China is complicated, with numerous pathways towards being a medical doctor (see Figure 1), with options to pursue (1) five-year bachelors in medicine, followed by a masters or doctoral degree program, which shortens their residency requirement, or (2) seven-year combined bachelors and masters (*qi nian zhi* or *qi nian song yan*) for students who score highest on annual college entrance exams, or (3) dedicated eight-year combined bachelors, masters, and doctoral program (which are only offered at a few select medical colleges) (Wu et al. 2014).

Bachelors in medicine (*ben ke sheng*) programs include two years of basic science, one year of pre-clinical training (when students learn differential diagnoses, and how to conduct a history and physical, etc.) and two years of clinical rotations. During my time in the gastrointestinal surgery department, their department had just become a required rotation for undergraduate students, which explained the twenty to thirty students who stood at the back of the room during morning report.

Upon graduation, these doctors with a Bachelor's degree in medicine can practice primary care medicine as general practitioners and can be hired directly at community hospitals which will provide additional training (the equivalent of an intern year and additional on the job training). Many students noted it would be very difficult to find a good job with only a Bachelor's degree (unless one's family had significant connections).

While in the U.S., a Master's degree is usually one or two years and either coursework or research focused, in China, the medical Master's degree is three years, during which students are assigned to a department, continue in-house rotations through various associated departments (e.g. someone receiving their Master's with an advisor in gastrointestinal surgery may also rotate through critical care, vascular surgery, and orthopedic surgery), and conduct research with their advisors. A student's experience during their Master's is very dependent on who their advisor is:

most students' clinical specialty is determined by which advisor accepts them. There is little personal choice in this decision, most students found advisors through social and professional networks, and many decisions depend on which advisor or department might be taking more students that year.

There used to be no formalized structure for Master's degrees, and how much clinical experience you get during these three years could be entirely dependent on how much time your Master's degree advisor wants you to be in lab. Recently, certain departments have formalized clinical rotation schedules and requirements. PhD programs are an additional three years of research and clinical rotations on top of Master's degrees. Most PhD graduates then conduct two years of post-doctoral research (*bo shi hou*) usually in the bench or laboratory sciences.

New China Hospital used to have a policy that in order to stay and work at the hospital as an attending, trainees had to complete additional post-doctoral fellowship research. However, after several years of this policy, one of my interlocutors told me that hospital administrators realized they were losing a lot of talent to other hospitals (who were happy to hire West China PhD graduates without additional post-doctoral research experiences). New China Hospital therefore changed their policy so that "especially talented" doctors could directly stay without a post-doctorate fellowship. As evidence of the ever-changing standards and rules, in recent years, some departments now require a three-year post-doctorate dedicated research fellowship (with no clinical duties) to keep up the publishing productivity of the university and hospital. These shifting hiring policies reflect the constantly changing requirements and absence of standardization across institution or even departments.

While in the US, one can become a physician by pursuing an MD, DO, or MD/PhD program after completing a bachelor's degree, no matter the degree program, every doctor must go through a standardized residency training, managed and overseen by the Accreditation Council for Graduate Medical Education (ACGME). In comparison, medical training pathways are less standardized in China and lack a single oversight body (Zhu, Li, and Chen 2016).

China's complex medical education system is a product of many reforms and attempts to standardize training, and medical training continues to be under reform. After being piloted in Shanghai for three years (Zheng et al. 2020; He et al. 2020), in 2013, the Ministry of Health [MOH] launched nationwide medical education reform, nicknamed the '5+3' program: five years of undergraduate medical study, plus three years of standardized residency training (SRT). SRT contends with many challenges, including inadequate supervision, highly variable teaching, and persistent inequality in training quality between high-resource and low-resource regions (Lio et al. 2016). Given that regional differences in quality of training and number of trained professionals have been shown to lead to health outcome disparities (Anand et al. 2008), the ongoing inability to standardize medical education in China continues to be a national priority.

One attempt to rectify these inequalities is the requirement for community physicians (those not at academic training hospitals) to complete a six-to-twelve month visiting fellowship (*jinxiu*) at a higher-tiered hospital before being promoted to junior-level or senior-level attendings (positions which come with improvements in call schedules and raised incomes). Little research has been conducted on the history of these programs, the standardization of requirements, or their efficacy in increasing intra-institutional knowledge transfer. Visiting fellows comprise a significant proportion of trainees who trade 'labor for training' (Prentice 2013:3) at academic hospitals, and their presence at Western Regional Hospital (and Western

Regional Hospital's presence at alliance hospitals) represents an attempt to ensure that community hospitals stay abreast of changes in clinical management or cutting-edge research.

These complex training pathways and medical alliances reveal different training priorities in China's medical education system: to train standardized, competent physicians and to produce academic researchers (through Masters/PhD programs which shorten the SRT requirement). At most universities and academic training hospitals, these two priorities clash, overlap, and entangle. Thus, while China's complex medical education system appears step-wise in tables or on paper, the absence of standardization or oversight of training means that in practice, surgical training extends beyond delimited and bounded stages of training.

This absence of standardization extends throughout training and changes the experience of being a surgical trainee, and even being a surgical attendings. While in America, after graduating residency and fellowship (completing "graduate" medical training), a physician is then an attending who can practice independently, in China, the delineation is not so clear. In China, there are both *junior attendings* and *senior attendings* (I sometimes refer to *senior attendings* as professors in this text). Junior Attendings (which include low-tier and mid-tier physicians) are early in their career and continue to be mentored by Senior Attendings (higher-tier physicians), who lead a group (*dai zhu*) of a one to four junior attendings, numerous graduate students, visiting fellows, and undergrads. In a way, a Senior Attending is like the PI (Principal Investigator) of a clinical lab, responsible for the clinical training and research development of their group.

Each ranking (early-tier, mid-tier, high-tier) has a different pay structure and different requirements, including years of employment, clinical abilities, research papers, grants and projects, service to the department, and additional scholarship. In order to move from a low-tire physician to a mid-tier physician, one must spend six to twelve months abroad in a clinical or research fellowship — most physicians go to the U.S. or Europe and do research fellowships, which are easier to arrange than clinical fellowships which often require licensing and accreditation steps.

These differences are not straightforward. Though many of the terms used in Chinese are direct translations of U.S. terminology, the words do not map onto the same roles or stages of training. An intern refers to a first-year resident in America; a "*shi xi sheng*" (intern) refers to a medical student on clinical rotations in China. Attendings have different roles, as do fellows. These roles reflect not just different structures of training, but changes in policy, reflections on regulations that exist due to patient-physician mistrust, or hiring incentives and pressures which reflect the priorities of hospital administrators and department chairs.

An absence of standardization means that patients do not trust any given doctor (as there is no standard doctor degree). Junior attendings can become attendings without standardized number of operations, and thus are not given liberty to practice independently until senior attendings deem them ready. These structural differences have consequences on the affective experiences of training as a surgeon and practicing surgery in China. Questions about differences in training open up conversations about trust in a profession vs. trust in an individual, about regulations and standardization, about priorities of medical education and training.

*On Gender*

My first day on my general surgery rotation at a county hospital in California was the first week of July. Perhaps due to the Independence Day holiday, many of the attending surgeons

were on vacation; it was also the first week of residency for the new intern class. Both of my chief residents (senior trainees in their fourth or fifth year of residency training) were women; the second-year resident who took all of the consults was a woman; both of the interns assigned to the service that week were women as well. In my first cases – a breast lumpectomy, an inguinal hernia repair, a below-the-knee-amputation – the attending surgeons were all women.

Thus, my first week on general surgery, every surgeon and surgical trainee I interacted with were women. This was not by luck: in America, approximately half of incoming general surgery residents are now female; at my home institution, that graduating class of five senior residents included four women.

I remember being in an operating room that week and reveling in the examples of "women in surgery" before me. I did not have just one person to model myself after, I had ten or so: extroverted surgeons, introverted surgeons, surgeons who valued the meticulousness of dissection and bloodless fields, surgeons who valued expeditiousness and efficiency, surgeons who cared about the history of instruments or trivia about 80s rock, all of whom happened to be women. Though I occasionally attended events catered towards "women in surgery" and felt gratitude for the residents who shared their experiences of childbirth, parenting, breastfeeding, or dating while in surgical training, I rarely thought about my gender vis-à-vis my surgical training. I never questioned whether due to my gender, I could be a surgeon: I only wondered what type of surgeon I would be.

When I arrived at New China Hospital, I was not surprised to find that all trainees and attending surgeons were men. Ten years prior when I had been in Guangzhou, the surgeons were all men as well. While their medical school classes were relatively equal in gender divide (and thus the medical students who rotated on our general surgery teams included both men and women), those who pursued general surgery training or Masters or PhD degrees with surgery mentors were all men. As a practical matter, it made little difference, until I asked to take overnight call with the residents, and the attending surgeons had to consider where I could sleep: the call rooms for residents had just two bunk beds (for the two on-call residents) and they felt uncomfortable with the idea of me sleeping in the same room as male residents (I felt uncomfortable with the idea as well, and avoided the call rooms anyway as they were always filled with cigarette smoke). Ultimately, they asked the charge nurse whether I could sleep in the nurse's on-call room, since there were both female nurse on-call rooms and male nurse on-call rooms.

Because there were still female students participating on rounds, the male-dominated nature of the surgical field became much more apparent in the operating room, where often those scrubbed in on the surgical team were men, and those assisting (scrub nurses, circulating nurses) or on the anesthesiology team were women. The first few times I scrubbed in, I was unfamiliar with their norms or how their teams operated, and the slight differences in workflow coupled with insecurity as a new member of the team created uncomfortable situations.

In America, once I scrubbed into a case, it was expected that I would stay until the end (students who stayed through the case are often "rewarded" with the opportunity to close the incision, one of the first tasks offered to trainees). I felt that if I scrubbed out of a case, I was missing out on chances to learn from residents or attending surgeons, or that I would be seen as less serious. Thus, I always felt it was "bad form" to scrub out for any reason (unless medically necessary or a conflict in schedule arose).

The first day I scrubbed into a case at New China Hospital was an open gastrectomy for gastric cancer. The case started at 9:00 am, and the more senior attending joined a few hours later to oversee and perform the more critical portion of the case. Not long after, around noon,, two of the other surgical trainees came into the operating room. The junior attending who was scrubbed in with me and the senior attending looked at me and told me to scrub out and eat lunch. I shook my head, wanting them to know I could be taken seriously, and wanting to stay to watch the senior attending operate.

The senior attending continued to operate, ignoring the conversation, but the junior attending was insistent:

*"You won't miss anything, really.*"

Turning his head to address one of the trainees he said, "*Brother Li! Show Bonnie where the canteen is and take her there.*" And turning back to me, "*Take a meal ticket, scrub out, go."*

Though I hesitated and protested, the other trainee was already scrubbing in, tapping me on the arm, and indicating that I should scrub out. I followed "Brother Li" to the operating room canteen – a separate canteen for surgeons, anesthesiologists, and operating room staff so that they did not have to change out of scrubs and walk down to the main hospital canteen.

The canteen was crowded and filled with the sounds of metal meal-trays and soup bowls and chopsticks. While that first day, I acquiesced to following "Brother Li" so that I could remind myself how to get to the canteen and where to place my meal ticket, several times in the first few weeks, I insisted on staying scrubbed in, not wanting to lose my place at the operating table, and fearing that the other trainees or surgeons saw me as needing a break or needing extra coddling. Though I noticed that other trainees took the opportunity for break readily, thankful for the relief, I wondered if this was a status they had earned, after months of being on the team.

I later learned that the canteen was only open between 12:00 pm and 1:30 pm, and if one missed this narrow window, no food was available until 5:30 pm. My fear of appearing weak or undedicated was mediated by a realization that being relieved for lunch was the norm (others took the break happily) and more seriously, if I did not take the break, I would not have anything to eat until dinner.

However, my fear of appearing weak was not unfounded; my new colleagues often commented on my gender and assumed fragility. I felt I represented a generation of women who perhaps wanted to go into surgery and had acquiesced to the waves of commentary to avoid it.

"Girls shouldn't be standing for so long, you must be tired!"

"Are you sure you want to be a surgeon? It's a very physically challenging and hard career for women."

"It's very brave of you to want to be a surgeon. Female students here find it too tiring. You must be tired too!"

As the weeks went on and I became more familiar with my team, I occasionally retorted: "it's a very physically challenging and hard career for everyone." Or once, when I was feeling particularly brave (or sassy), "women carry pregnancies for nine months; if we're strong enough to do that, we're strong enough to be surgeons."

The push for me to take breaks around meal times seemed partly gendered (there were no women surgical trainees, and my colleagues wanted to make sure I was okay), and partly just that making sure I was fed was their way of caring for me. I was new, I was a foreigner, and I was female, and part of being a host or a mentor (*daoshi*) was making sure that I was well fed. Taking one's students out to eat is a central component of mentorship in China, and many of my

best meals over the course of my years of conducting research in China have been with various research teams. Mentors are expected to feed and nourish those more junior: to make sure someone is fed is a basic expectation. I was often handed bento boxes at research meetings or a bag of breakfast before getting in a car to visit a hospital: to skip a meal would have been absurd, and that had little to do with my gender.

Regardless, the comparison between the proportion of surgical trainees who are women in America (close to half) and in China (close to none) is stark. I never met a female surgeon in my time visiting and participating in various surgical departments in China, though occasionally when discussing gender, a Chinese colleague would name one or two female surgeons (often in the breast surgery or endocrine surgery departments). Though I never managed to interview or meet with them, I could imagine that their experience differed significantly from the experience of my female surgical mentors in America.

One visiting department chair commented to me during a surgery that they had a female surgeon in their department but that "She does not carry the same weight. She got pregnant recently and everyone else has to pick up the slack because I cannot assign her the same surgeries as everyone else. I am the department chair and I have to look out for her health." It is easy to see this statement as paternalistic, that the department chair feels he has to protect her and therefore does not allow her to work even if she is capable of doing so. I immediately took a dislike to this visiting department chair, but tried to understand his perspective.

In contrast, during one of my surgical rotations, my chief resident asked the attending if she could leave the surgery to pump breastmilk; he re-arranged the surgeries so she could be fully present for the surgery she was more excited about and allowed the intern to take her place for the fifteen or twenty minutes during which she had to step out. If he felt that her breastfeeding or pregnancy was resulting in others having to "pick up the slack," he certainly did not verbalize it to us.

My early reflections on the gender differences between surgical practice in China and America framed China as behind America with regard to gender politics. However, to make this claim would be to oversimplify: to default to a hierarchical or linear approach to an assemblage. Feminism and the history of women in the workforce (and women in traditionally male roles) is different in modern China than it is in modern U.S. history; the state of childcare and cultural norms around parenting roles and nuclear families also differ. When I first arrived in Valley City, I assumed that women might be stuck in "traditional" gendered roles of childcare; I found a culture of working women, mothers who worked and reveled in their independence, and divorcees who initiated divorce to chase their own narratives of happiness.

Even still, reflecting on my own entrée into general surgery, joining a field where one has role models changes the options available. The other trainees that I spoke to said that women just "don't want to" be in surgical fields, that they were not attracted to the long hours or to the standing (this sounds ridiculous, but two neurosurgeons told me they chose neurosurgery as a surgical field because it was one of the few surgical specialties that operate sitting down). But I wondered whether the men understood the barriers, or whether female students did not see role models for them available.

While I was at New China Hospital, a female Masters student rotated through our department. Most students rarely scrubbed in on cases, prioritizing floor patients and studying for exams. She was always in the operating room, at first to my chagrin (the trope of any

minority feeling threatened rather than excited at the presence of "another" minority). But I welcomed her presence, her determination; I could see her taking every opportunity to practice surgical technique, to watch closely, and to avoid criticism. At the end of her rotation, she told me she was jealous that I was training in America. "It seems like there are fewer barriers there." But she was not meek, and though she spoke of barriers, she told me about the challenge of finding good research mentors, not of being the only female on a team. She told me it was nice to have me in the operating room, and then she rotated off our service, and I did not see her again.

When I spoke to the children of my older friends, both college-aged girls and boys expressed interest in medicine or medical fields, citing the job security and financial security. None of them expressed interest in surgery, laughing at me when I asked them why: why would I want such a hard life? I don't want to stand all the time and I don't like waking up early. When I asked why some of the surgical trainees had chosen to go into surgery, they laughed at me also. It was not a choice they made, or at least, not one that they made consciously. Applying for a Bachelors in medicine was often the decision of a parent (or under the influence of a parent who themselves were physicians); ending up as a surgeon was just luck, the path that they had ended up on. Perhaps it would have been better to question the parents or mentors of trainees, both men and women, to as why they had been guided towards their respective paths.

The contrast in medical training structures and in gender make-up of surgical departments are easy differences to spot as an individual who traveled between and experienced two iterations of surgical practice. However, neither of these differences were differences that my interlocutors attended to, nor are they differences that my colleagues in either location asked me about. However, because they are easily exemplified through tables or numbers, they provide simple example of how each comparison opens various "lines of flight."

## MAPPINGS AND GLOSSARY

Though my medical training was necessary for access into operating rooms and into the surgical world of my dissertation, I attempt throughout these chapters to avoid unnecessary technical jargon. However, as both a medical trainee and an anthropologist, there were certain mappings and configurations (some of the medical world, some specific to China) which took me several months to disentangle or make clear (and even still, I might have gotten them wrong). For hopeful ease of understanding, I present some mappings here. They can be treated as a somewhat dry technical briefing, to be read in advance of the following chapters, or as a glossary, to be referenced when curious or confused.

*Healthcare Systems and the Chinese Healthcare Systems*

*Primary vs. Secondary vs. Tertiary Care*: Medical services are often divided into primary, secondary, and tertiary (and sometimes quaternary) care levels based on the complexity of care.

Primary care refers to essential and basic care for chronic conditions (hypertension, diabetes, vaccinations, family planning) and simple acute care (colds, rashes, etc.). In some countries, primary care is delivered by primary care providers (PCPs) or general practitioners (GPs), which can include medical doctors, nurses, or other mid-level providers. Pediatricians, gynecologists, and geriatricians can all provide primary care. In China, primary care is provided through village clinics or health centers and urban community health stations and centers (see Figure below).

Secondary care refers to specialist care: the providers are people who have received specialist training, e.g. cardiologists, endocrinologists, etc. Patients seek secondary care for brief but more serious illnesses or injuries. In some medical systems, to see a secondary care provider requires a referral from their primary care provider. In China, patients can directly seek out (*gua hao*) a specialist, who could be in a smaller community clinic or at a larger hospital.

Tertiary care generally refers to specialized in-patient hospital care. Patients who require specialized care (operations, procedures, infusions) are seen at tertiary care centers, which are mostly hospitals. Tertiary care centers include advanced specialist support, whether advanced nursing, intensive care units, and diagnostic support services (specialized radiology and pathology departments).

*First-Tier vs. Second-Tier vs. Third-Tier Hospitals*: Hospitals in China are organized into a three-tier system based on their ability to provide clinical care, clinical training, and conduct clinical research. The official designation of tiers depends on several factors: number of beds, location of hospital (population of city, county, or district), health services provided, training programs (and their accreditation), and strength of clinical research. Third tier hospitals are further subdivided into sub-leveles: 3A, 3B, and 3C (with 3A being the highest tier). While first and second tiers are also theoretically subdivided; I rarely heard those sub-levels referenced. The tiered hospital system is often referred to as *sanji shideng* (three tiers, ten sublevels – the tenth sub-level 3AAA is reserved for ultra-specialized hospitals).

Hospitals are continuously seeking to be accredited at highest levels. The accreditation process is stringent, involving multiple visits from government officials, many of which happen without notice and undercover. A hospital indicates when they are applying for re-accreditation:

at each accreditation they are just as at risk of being taken down a sub-level. The politics of tiers and sub-levels is complicated and further discussed in Chapter Four.

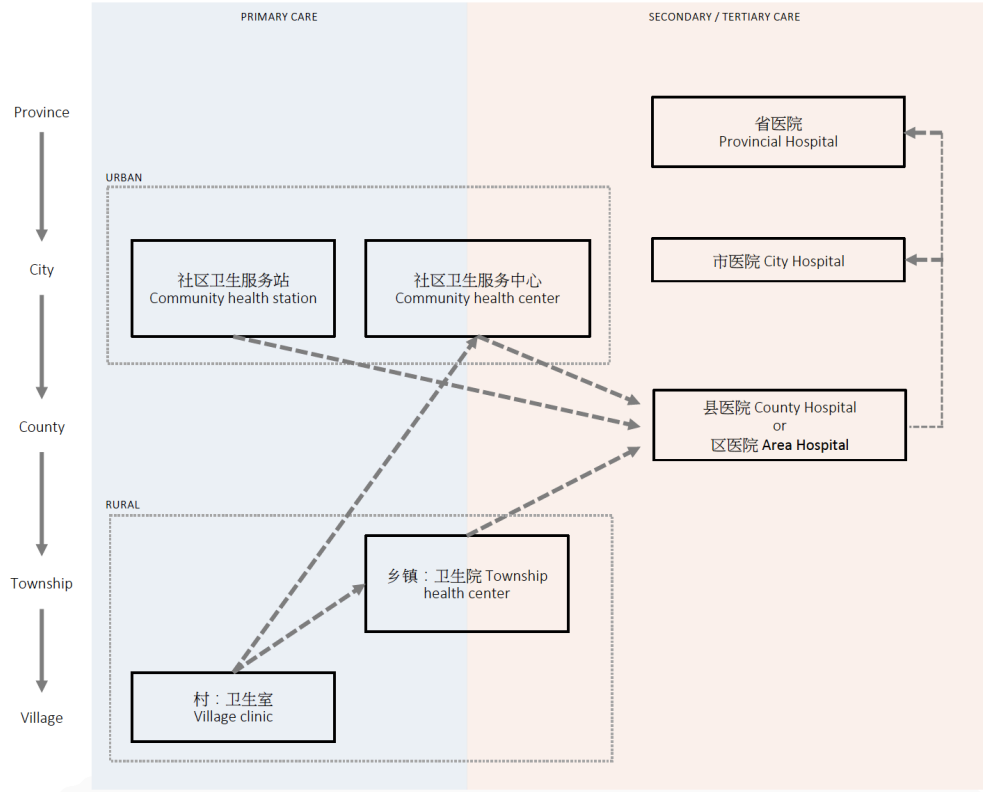



Figure 1: Primary vs. Secondary vs. Tertiary Care and Location of Healthcare Centers

*A day in the life of a surgery trainee*

*Morning Report:* Mornings begin at 7:45 AM with morning report, an "all-hands" meeting with chairs and vice chairs of the department, all attendings, residents, fellows, medical students, and other trainees. The meeting is led by the chief residents, who stand at a podium to the left of a giant LCD screen, on which they project a PowerPoint which shows case numbers from overnight, as well as patient cases with corresponding imaging and intra-operative photos. The chair of the department sits flanked by his three vice-chairs at a desk at the front of the room, facing the rows of train-concord plastic seats which attendings fill. Behind them, standing cramped together and often not paying attention, are the rest of the trainees. In the computer stations at the back of the room, some residents continue to work on their charting.

Morning report is an opportunity to gather as a department and go over cases. The chair often interjected learning points as cases were discussed or quizzed those who were involved in cases on why they made certain management decisions. Morning report concluded with any department wide announcements: upcoming lectures or inspections, changes in policies, or warnings and chastisements. Once a week, on Thursdays, morning report included a mandatory political thought lesson, led by the departmental party representative. Usually, this entailed a prepared PowerPoint on that week's political learning theme, clicked through rapidly, with small attempts to tie the messages to clinical work.

*Rounding*: At 8:00 AM (or 8:30 AM, or whenever morning report finishes), senior attendings would gather with their teams outside the morning report conference room, to round on all of their patients, usually a list of fifteen to forty patients, depending on how busy the service was. These were predominantly post-operative patients whose wounds and drains were examined. Patients asked when they could start eating or asked to stay another day. Occasionally there were pre-operative patients who were admitted to the floor to await surgery or to receive medication or nursing care prior to surgery. The junior attendings and chief residents led rounds, with the senior attending commenting as necessary – the medical students and trainees generally followed in the back and did not participate.

After rounding, chief residents, fellows, or junior attendings who were operating headed up to the operating room to prepare for the operations, and those who were not operating returned to their offices or workstations for research, charting, clinic or meeting with patients. Medical students, residents, and trainees who were not operating were in charge of the floor patients (pre-and post-operative patients who were on the unit). These trainees changed dressings, wrote orders for medications, wrote patient charts, and responded to patient families.

The large conference room where morning report was held became a post-operative clinic during the day, where residents would see patients who had returned several weeks after their operations. It also served as a space for conversations with patients and their families to go over imaging or make decisions regarding surgery: often there would be several informed consent conversations happening in close proximity to each other. At the side tables, sometimes research coordinators would gather their paperwork and prepare cases which required signatures.

In the late afternoons and evenings, the same conference room served as a meeting space for multidisciplinary tumor board, or for research groups to hold their works-in-progress lab meetings and to discuss publications and projects. From morning to evening, the conference room was always filled with some level of activity.

*Operating*: First cases in the OR start at 9:00 AM. By 8:45 AM, a resident or trainee was expected in the OR to help position the patient and check paperwork. Usually the junior attending, chief residents, or fellows would start the case and the senior attending would join an hour later after the initial incisions, exploration, and dissections had been completed. If the operation was short, everyone left the OR for the canteen, which was within the operating suite, so that nurses and surgeons did not have to change out of scrubs and go downstairs in order to eat. The canteen was only open between noon and 2:00 PM, so if the operation seemed like it was going to last longer than 1:00 PM, residents would come into the OR to relieve other residents so that they could eat.

Operations lasted until the last case was finished. For some surgeons this was usually 5:00 or 6:00 PM; for most it was much later, with the last cases finishing around 9:00 PM or 10:00 PM or sometimes midnight. If the junior attending was on call, they would be willing to start a large case at 5:00 PM, operating late into the night, and leaving to see or help with emergency cases as needed.

*A few notes on operating rooms*

Operating rooms are usually arranged along long hallways within an operating suite, which includes an ante-chamber for receiving scrubs and washable shoes (fake crocs), locker rooms and

changing rooms, operating rooms, large metal sinks for scrubbing in, supply rooms, and a break room for operating room staff and physicians to have lunch or tea between cases.

*Cast of characters*: Every operating room includes a surgical team (the attendings, residents, and trainees) and anesthesia team (usually one anesthesiologist but sometimes one anesthesiologist and one trainee). Each operating room also has nursing staff: a scrub nurse who is scrubbed in and assisted the surgery by handing sterile instruments to the surgical team as requested and a circulating nurse who is not scrubbed in and who opens additional instruments or materials onto the sterile field. The operating team and scrub nurse are sterile and can touch the sterile field, which is draped and the patient. All others (anesthesia, circulating nurse, visitors, etc.) are non-sterile and must be careful not to contaminate the sterile fields. The circulating nurse serves as the liaison between the "clean" (sterile) and "dirty" (non-sterile) worlds and often runs errands outside of the operating room (e.g. to get an additional instrument that is not in the operating room or to drop off a specimen to pathology).

*Scrubbing/scrubbed in*: Being "scrubbed in" means someone has washed their hands using aseptic technique, and put on a sterile gown and sterile gloves in the operating room. Sterile gowns were green, as were the drapes which covered the patient and instrument stands. Once "scrubbed in," one can touch sterile instruments and anything within the sterile field; if you touch something that is not sterile, the expectation is to change your gloves (or sometimes, scrub out and scrub in again). Only a section of the front of your body (the hypothetical box between your shoulders and above your waist) is considered sterile – your back is not sterile, nor are your legs, thus hands (sterile) must be kept within this hypothetical box.

*A few surgical terms of interest*

*Laparoscopic vs. Open*: Open surgery refers to "traditional" surgery where a surgeon makes a long incision to visualize the inside of the abdomen and removes diseased tissue through that long incision, which is then closed and leaves a long scar which is often stapled or sutured. Laparoscopic surgery refers to placing a number (usually three) of trocars (plastic portals) into the abdomen, insufflating (adding gas to expand) the abdomen, then placing instruments and a camera through the trocars in order to manipulate tissues inside the abdomen without creating a long incision. The diseased tissue is removed through a bag which can be taken out via a small incision. The sites where trocars are placed leave small 0.5-1.0 cm incisions which are sewn up with single stitches (sutures).

*Gastric cancer and Gastrectomies (D2, D3):* Gastric cancer has a much higher incidence (approximately 30 in 100,000, though it has recently been declining) in China than in the U.S. or U.K. (<5 per 100,000). In China, gastric cancer is the third leading cause of cancer-related deaths. A gastrectomy is the removal of a stomach. However, as with all cancer surgeries, you cannot just remove the cancer itself, you must remove the cancer with wide margins around it, making sure that all of the tissue that remains is healthy tissue which has no cancer cells hiding. The edges (margins) of what is left behind are sent to a pathologist immediately and intra-operatively and the "frozen" section is read immediately by a pathologist who calls back to let the surgeon know whether the margin is negative for cancer cells. If it is not, more tissue needs to be taken.

Most cancers metastasize first to lymph nodes, and then to other organs (some cancers metastasize via the blood stream, though this is rare). Throughout the body, fluid drains into the lymphatic system and collects in a series of lymph nodes, fatty tissues which form a network throughout the body. Cancer cells therefore travel first to the lymph nodes closest to the original site of cancer, then slowly to other lymph nodes along the lymphatic system.

A D2 gastrectomy describes the process of taking out the entire stomach (gastrectomy) plus an "extensive" lymphadenectomy, or removal of "associated" lymph nodes. The National Comprehensive Cancer Network (NCCN) guidelines recommend that gastric cancer resection include regional lymphatics including peri-gastric (around the stomach) D1 nodes as well as those along the left gastric artery, common hepatic artery, celiac artery, splenic hilum, and splenic artery (the D2 lymph nodes) with a goal of examining at least fifteen lymph nodes for to evaluate them for the presence of cancer cells. D2 gastrectomies were pioneered by Japanese medical centers, and Japan, Korea, and China have shown significant survival benefit to performing pancreas and spleen preserving D2 gastrectomies. D3 lymphadenectomies add the para-aortic lymph nodes to those described above ("extended" lymphadenectomy).

*Colon cancer and colectomies*: colectomy refers to the removal of a colon (hemi-colectomy = the removal of half a colon). Colon cancer can occur anywhere in the colon: where the tumor is, how large the tumor is, and what blood vessels are associated with the tumor determine what type of colectomy needs to be done.

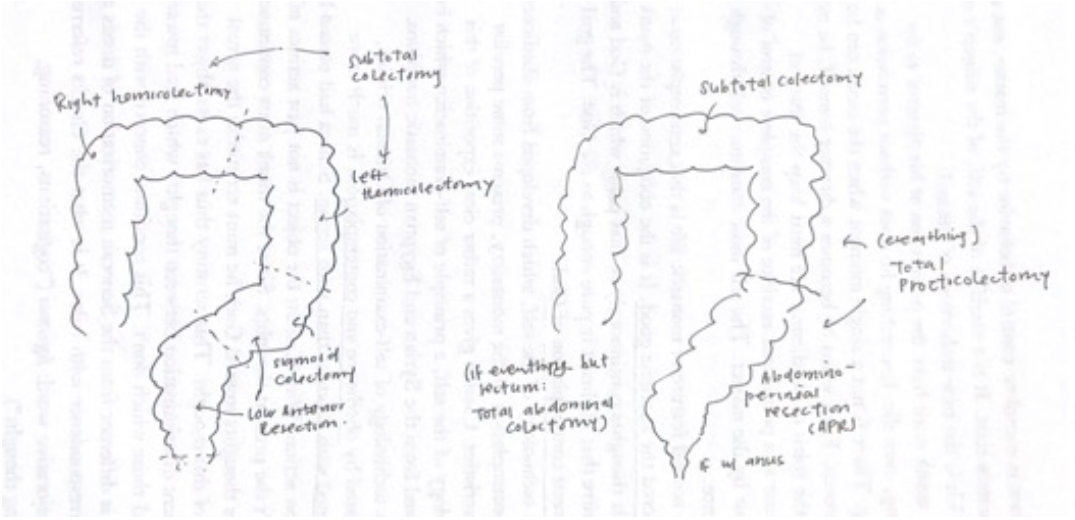



*Image 1:* Variations on Colectomies for Colon and Rectal Cancer (reproduced from field notebooks)

*Rectal cancer and associated surgeries*: rectal cancer is usually treated with a lower anterior resection or abdomino-perineal resection. New China Hospital is known for sphincter-sparing surgery, which means that even in low-rectal cancer that would normally require the surgeon to remove the anal sphincter, New China Hospital surgeons are sometimes able to preserve the anal sphincter, allowing the patient to not require a permanent colostomy. While the sphincter-sparing surgery is often preferred by patients due to the stigma around colostomies and is a technically-complex surgery that many trainees come to New China Hospital to learn, there is ongoing debate whether the post-operative results are in fact better, as sphincter-sparing operations are known to result in incontinence and stool leakage, which lead to poor quality of life.

## CHAPTER ONE: Differences & Standards

In operating room twelve, a crowd had gathered. It was not uncommon for one or two students to mill about the operating room, sitting on metal stools, or squatting in corners scrolling through their phones. Though usually a maximum of three individuals[29] scrubbed in around the operating table, if trainees were not busy managing pre- or post-operative patients on the floor (in the surgical unit patient rooms), they were encouraged to come up to the operating room to learn.

But that day, a true crowd had gathered – ten or fifteen individuals hovering throughout the room. It was a laparoscopic case, which meant everyone could watch the screens without hovering on stacked step stools, peering precariously over shoulders and into the operative field. Amidst all the bodies, technologies, and cloth, the patient body was rendered invisible, though his diaphragm was magnified and multiplied on three different screens. All observers could see the same image that the surgeons saw, the shades of dark pink muscles and light pink mucosa, dull yellow fat streaked with thin red vessels, pearly white layers of fascia which then slowly became tinged with red. All of us watched the same magnified abdomen, our triangulated gaze making objects of us all.

It was several months into my time at New China Hospital, and I wondered why this, of all surgeries, had garnered so much attention. I wondered also if previous surgeries had gathered similar crowds, but I had not yet established myself as an insider enough to hear about them. So, I quietly commented, to no one in particular, "there are so many people in here."

One of the trainees who recognized me from having rotated in Professor He's group a month prior laughed quietly and said:

"It's not every day we get this operation. It would be stupid to forgo the opportunity to see it!"

Dr. Wu was operating and the case was a laparoscopic hiatal hernia repair. A crowd had gathered because these cases are rare, unusual enough that students felt they needed to take this opportunity to watch it. Ironically for me, my surgery mentor back in California does laparoscopic hiatal hernia repairs with relative frequency and it was an operation I had seen many times before[30].

But I remembered my first time in Professor He's operating room, seeing my first D2 gastrectomy dissection and the feeling of awe and surprise and intense curiosity at a surgery I had never before seen, and I understood why so many had gathered.

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[29] Only two or three trainees (students, residents, or fellows) could be scrubbed into a case at any time: the "primary surgeon" was always the senior attending, "first assist" was usually a junior attending, and "second assist" could be one (or two) trainees scrubbed in to help. If the senior attending had not yet scrubbed into the case, everyone shifted up one role: the junior attending would take the role of primary surgeon, and the most experienced trainee would first assist him.

[30] I had done my general surgery rotation at a large county community hospital with a busy trauma service and at an academic quaternary hospital well known for their cancer surgery. I had loved my experiences operating and decided I would pursue a general surgery residency. Thus, even after completing two-months of required rotations, I continued to spend time in ORs on a twice weekly basis, observing various abdominal surgeries. My close mentor was a minimally invasive surgeon (minimally invasive indicated that he primarily did laparoscopic surgeries) who specialized in bariatric surgeries and did laparoscopic hiatal hernia repairs with some frequency.

Just as trainees crowded into Dr. Wu's operating room to see him do a laparoscopic hiatal hernia, Professor He knew that many of these trainees joined in his team for the sole purpose of observing him conduct the D2 gastrectomy operation – a complex operation to remove a number of lymph nodes in addition to the tumor. "物以希为贵" (*wu yi xi wei gui*) roughly translates to objects which are rare are valuable. Just as Dr. Wu's laparoscopic hiatal hernia is rare, the D2 gastrectomy as an operation is rare (and therefore a valuable learning experience), but the surgeon who does the rare surgery is equally rare and equally valuable. Each of these operations draws special attention because they represent an opportunity to prove distinction and difference, an opportunity to protect or create a legacy: of an individual, an institution, or a nation.

Surgical training is about numbers: it is about racking up repetitions of operations (number of operations of a given type, with differing layers of complexity), of accumulating a diverse repertoire (number of types of operations), and the operating room is the site of that training. The complexity of surgical operations has increased over the decades, but new modalities allow for various forms of instruction and training. Many videos of laparoscopic and open surgeries exist on YouTube (or Weibo or Youkou or whatever video-streaming or video-watching service is most beloved), which has sped up the spread of complex surgical techniques to regions which may not otherwise have opportunities to learn or witness such surgeries. One fellow tells me:

> It's much easier now that you can visualize and record all of these surgeries whether from a laparoscopic camera or even a headlamp or microscope — you can send your videos to others to have them critique them or you can watch other expert's videos online. I watch these videos on the internet, then read papers, then read textbooks, then try myself, then watch my own videos, and its much faster to learn this way than it was before. And those younger than me, they learn even faster than I do. It's getting faster and faster, the ways we learn and adapt to new techniques and skills.

New skills are proliferating, whether it is new surgical modalities like laparoscopy or robotic surgery, or new surgical operations and approaches to better remove diseased organs and tissue. Every eager physician, no matter where they are or where they train, can watch these videos and learn from them, to see what others are doing across the world.

However, surgery cannot be learned through these virtual and visual modalities alone. Watching a recording of Dr. Wu doing a laparoscopic hiatal hernia repair (or perhaps, an expert in hiatal hernia repair in a different country) is still not the same and not as good as being in the room where it happens: despite the advancements of technology and medical education, surgical training still requires physical presence in the operating room, ideally, presence *at* the operating table, participating in the operation.

That is why there are so many people packed in this operating room (even if a number of them are on their phones); that is why there are so many students or visiting fellows who choose to travel from other cities or other provinces to New China Hospital for their graduate training or required mid-career fellowships. That is why, as numbers continue to matter for differentiation, surgical training experiences challenges in standardization.

This dissertation is situated at New China Hospital as a place of prestige, where visiting fellows train and visiting professors present their research; where international speakers and foreign students are commonplace, and my presence and curiosity were therefore accepted as within the norm. This prestige is often showcased in the operating room, where surgeons perform operations which are not performed elsewhere or trainees accumulate surgical experience which cannot be accumulated elsewhere. In the operating room, I often heard comparisons drawn between individuals, between hospitals or institutions, or between countries – sweeping generalizations which compared Chinese surgeons (collectively) to European surgeons, surgeons of one institution with surgeons of another, even if such comparisons might seem to be meaningless. Meaning is made through these comparisons: a certain narrative is enforced.

This chapter explores operating room as training ground: rather than focusing on the patient body as the focus of a surgical practice, I focus on the surgeon body as object, the training of the surgeon body and the model of the senior surgeon. I explore the narrative of China's superiority which emerges in this training space and which finds its foundation in the accumulation of numbers, as well as narratives of discipline, sacrifice, and hard work. I consider how the need for case volumes and repetition are hindered by a push for standardization and the way standardization is hindered by the haptic nature and apprentice model of surgical training. Ultimately, "good surgeons" are made in these operating rooms, and this chapter examines how they are made, how distinction takes form, and the meaning (or meaninglessness) of surgical distinction.

### *Difference in numbers*

In the first month of my fieldwork, my friend forwarded me a flyer for a talk, which boldly proclaimed: "Differences between American and Chinese medical training: hear from someone who did both!" The speaker was his former roommate's wife and he thought I might be interested in joining residents and trainees to hear her reflections. When I finally found the classroom where the talk was held, almost every seat was taken; by the time she started, students lined the walls and sat in the aisles, a rough count told me that over two-hundred were packed into a small lecture hall.

The speaker, Dr. Xiao, had been a seven-year undergraduate-plus-masters student at West China medical school and completed four years of general psychiatry residency at New China Hospital. Feeling frustrated with the medical system in China, she applied for a PhD in Psychology, hoping to become acquainted with the medical accreditation system and improve her English fluency. Even if she could not get into a U.S. medical school, she would return to China with an American PhD: an accreditation that would bolster her research and clinical reputation. While completing her PhD, she took the U.S. Medical Licensing Exams, matched into a psychiatry residency, fast-tracked into a fellowship, and stayed on at the same hospital as an attending. After eleven years of training in China, five years of a PhD in the U.S., and then five years of residency and fellowship, she was finally an attending at age thirty-nine.

Her presentation style hybridized her training at both American and Chinese institutions. Her introduction welcomed questions and discussion, an uncommon pedagogical modality at this institution, where lectures were hierarchical and unidirectional. Yet throughout her presentation, her Mandarin retained the cadence of young communist marches and the chanting of slogans, the emphasis on certain phrases, the pregnant pauses, and pride shining from her upturned face as she praised her experience at New China Hospital. Part of this could be explained by the

presence of her former research mentor who is now a hospital administrator. But regardless of biases, her presentation described the strengths of her New China Hospital training, which she extrapolated to describe training in China in comparison to training in America.

Describing her training "back in the early days," she built collegiality with her audience, thanking them for joining her for this lecture despite their busy schedule. It was exactly that busy and rigorous training that would make them strong:

> You know how hard we train and how many patients we have. I learned perseverance here, and my American colleagues tell me that I am– I am like a machine to them, because I can eat bitterness (chi ku), I can take it all. This is my habit, this is part of my life. Americans talk about work-life balance, but I cannot split my work and my life. You know – we are so used to working later than five p.m. and working on the weekends and going home and doing research afterwards. This is why Chinese rise faster than Americans — because we are used to working hard. If you make errors and fall and give up, that is the end of your path. But if you keep going, that will be your success.

She tied her work ethic and perseverance to her success, a willingness to continue in the toughest conditions. But she extended her own experience beyond her own individual success to the success and rise of an entire nation of doctors, professionals, and citizens. Work-life balance and wanting to work fewer hours was portrayed as weakness; China's rise could be attributed to their collective willingness (as a nation) to eat bitterness, to suffer through the difficult.

But given the notorious issues of patient-physician mistrust in China which existed even in her training days, she also described a willingness to go the extra step for her patients that surprised me.

> In America, if a patient was supposed to come in at 8 AM and they come in later, at 10 AM, my colleagues won't see the patient, but I will fit them in. I will use my lunch time or I'll squeeze the other patients shorter a bit. That's the difference between me and the Americans — I understand that the patient took a long time to get here. At New China Hospital we're used to that — people really travel long distances to get care. I'm not doing this for money or fame, I'm doing this for my patients. My colleagues see that I am always doing more.

I question whether perhaps her American colleagues feel the need to adhere to a strict late policy because that is their understanding of fairness, rather than out of lack of compassion for the patient. But what is more important is what Dr. Xiao took away from their differences in approach. Her interpretation was that her ability to squeeze in extra patients made her a better doctor and allowed her to get ahead.

The point of the presentation was to draw comparisons between the Chinese training system and the American one, and her pride of New China Hospital as her alma mater extended to conclusions about both medical systems overall: "The American government, if trying to manage a Chinese population, could never manage it." She tied her work ethic to her training, and her training to the ethos and strength of her country and government. She explained further: "you all work tirelessly to take care of Chinese patients. American doctors could never do what you are doing, with the number of patients that you see."

The generalization of "American doctors" and "Chinese patients" were common in conversations I had with others. It seemed like she sought to instill in these students a pride in what they were accomplishing by being so busy, tired, and efficient. At New China Hospital, she said throughout her talk, "it is a numbers game," and these students at her lecture are getting the most numbers by training at New China Hospital — the most patients, the most hours, the most research experience.

### *All for the case volume*

The focus on China as a fertile training ground due to "large numbers" is not unique to surgical or medical training: China has long touted its ability to do research and train scientists and physicians better and faster due to its large population of patients and research subjects[31]. Throughout my time at New China Hospital, my mentors often joked with me and told me they would be here when I needed to undergo a "West China" version of surgical residency: "whenever you're ready and you are done with your residency in America, come work with us for a few months. You will surely do more and see more than you can ever imagine!"

Repetition is part of the draw of coming to New China Hospital, and students and trainees are often reminded that there are more cases here of complex diseases and complex patients than they would otherwise see. This is commented on not only in operating rooms but in morning report, where complex patients admitted the night before are reviewed collectively as a department. These overnight surgeries are often the chief residents' opportunity to operate and learn – the scheduled operations during the day are done by attendings: with one senior and one junior attending, and a resident or trainee as second assist. In contrast, the overnight emergency surgeries are done between a junior attending (who is on call, or "second-line") and the on-call chief resident, one of two "first-line" doctors who oversee the management of over a hundred patients, taking care of any of their emergent post-operative needs and any surgical cases which come through the emergency department.

Emergency operations are done in the second-floor emergency operating suites, right above the emergency department bay, rather than the extensive operating suites on the eleventh through thirteenth floors. These operating rooms are sparse in their furnishings, much larger, with more room to maneuver in bulky machinery as needed. The operations which happen in these suites are often more relaxed despite the acuity of surgeries. Senior attendings rarely show up, the scrub nurses and scrub tech seem less uptight, joking with the trainees, who spend many late nights in these operating rooms, slowly doing surgeries and waiting for patients, or waiting for their on-call attending to arrive.

These late-night surgeries which prevent any sleep embody the "*chi ku*" that Dr. Xiao: a willingness to take every-other-day twenty-four-hour call is what gives each of the chief residents the training (the case numbers! The experience!) that makes a West China trained surgeon so renowned and respected. The chair of the department said one day in morning report:

> The more operations you do, the harder you work, the more you suffer, then the stronger your ability — that's just how surgery is. The more operations you do,

[31] See Ong (2016) on Beijing Genomics Institute or Song (2017) on access to stem cell samples. This is the same logic that has driven the rise in recruitment of patients and research subjects for clinical trials in sites outside of America or Europe due to a larger, treatment-naïve population. The same logic also applies to international attention for hospitals models like Narayana health in Bengaluru, India, where a single operation is done ad infinitum.

> that becomes your experience, it is not something you can learn from textbooks. You need that basic technical ability, but everything beyond that is from the clinical experience you have from operating on patients and managing patients on the floor.

Overnight call, as arduous and grueling as the hours may be, are what the chief residents are here for. It is their opportunity to operate more independently, to have fewer fellow trainees competing to scrub in on the case. Chief residents will prep and drape the patient, start the surgery, making incisions, and beginning the operation, often pausing only before the final "cut" of a bowel resection, placing their instruments down and leaning against the patient body while waiting for the on-call attending.

During my time at New China Hospital, the department began cracking down on the unsupervised nature of these surgeries. Many of the on-call second-line junior attendings were not going down to the operating rooms, assuming that the chief residents could handle the simple surgeries on their own. Often, the residents did not badger the on-call attending, operating independently instead, which occasionally led to questionable surgical outcomes. Across the hospital, departments began to monitor whether or not on-call attendings were present during emergency surgeries, and the chair of this department was embarrassed and infuriated to find out that this department ranked lowest in terms of attending attendance, with under 50% of surgeries being supervised.

To remedy this, new policies were implemented requiring attendings to scan a QR code when arriving in the operating room, within ten minutes of the operation start-time. When it became clear that the QR code was just being texted to attendings to allow them to scan from their call rooms, they implemented the need for a physical signature as well (which could, of course, also be forged). After the implementation of these policies, one attending commented: "why are they treating their employees like convicts?" The same attending told me that this policy was actually detrimental to the residents' training.

> The whole point of being a chief resident at New China Hospital is the operative volume. The residents now have fewer and fewer opportunities to operate. It used to be that attendings would not show up for emergency surgeries at all but now we are required to be there for every surgery. And if we are going to be there, we would rather the surgery happen faster, so we do it, instead of letting the trainee struggle. But they have to learn, and now they do not have opportunities to.

I can imagine a middle ground, where surgeries are supervised but trainees still have the opportunity to learn. But there is always a scarcity mindset – there are never enough surgeries and there is never enough time. However, data collected on the lax regulations of independent operations without graduated responsibility meant that these metrics needed to be addressed: sub-optimal surgical outcomes, no matter the reasoning, would lead to lower rankings (of the department, within the hospital, and of the hospital, amongst its national peers). Beyond impacts on patient morbidity and mortality, the surgeries of these rogue chief-residents represented a lack of standardization, and as multiple senior attendings said to me, and as the chair said to the department, "lack of standardization is what is preventing China from rising. We must find a way to standardize."

### *Difference within Standardization*

New China Hospital hosts one of the most competitive and elite medical schools in the country. Often ranked within the top ten universities at which to study for a medical degree, it is usually the only university which is not in one of the coastal first-tier cities[32]. West China's reputation as the best medical school and training hospital in the Western region draws medical students and trainees from across the region, and internationally as well. As a singular elite medical institution in the entire Western region (compared to the dozens on the coast), New China Hospital and medical school draws from a wider catchment area for both patients and trainees.

The operating rooms at New China Hospital are therefore accustomed to a constant flow of visitors. The Bachelors, Masters students, and PhD students[33] at West China medical school do a month (or more) of general surgery as part of required rotations or clinical training. Visiting fellows from other hospitals in the province or throughout China come for their visiting fellowships. Prior to the implementation of a required medical residency training (pioneered and first established by New China Hospital's renowned department of anesthesia), graduates of a medical bachelors were hired by local community hospitals, which then required young doctors to do a visiting fellowship at a different (higher tiered) hospital before they could be promoted. New China Hospital continues to be a preferred site for visiting fellows from around the nation due to their high ranking and high patient case load.

Entire subspecialties of surgery have spread through China through this mid-career fellowship training requirement. No one could tell me how long these visiting fellowships had been going on, though most said at least a few decades, and they seemed like such an ingrained and necessary part of the work force for New China Hospital, that I could not imagine patient care happening without them. One of the fellows on our team came from a very rural village at south-most border of Yunnan. He told me that their entire hospital had learned to do specialty surgeries by sending their surgeons one at a time to train for a year at New China Hospital. Some of these fellows merely bided their time, but many fellows came to learn specific surgical techniques or a different approach to patient care: "how to plan a surgery, manage a patient's care, or what might be important during a surgery (lymph node dissection in addition to pure resection, for example*)*." Some became inspired to try to do research at their own institutions. A few fellows said they would continue coming back on their days off to watch certain surgeons at New China Hospital in the operating room, to continue to be inspired by their technical precision and their medical knowledge.

I was told that the entire existence of neurosurgery in Tibet is because one surgeon came and did his fellowship at New China Hospital, was assigned to a neurosurgical team where he learned to evacuate head bleeds and do basic emergency neurosurgical operations. With the support of several of his colleagues he met at New China Hospital, he brought back crucial equipment and taught others to perform the most basic neurosurgical operations like releasing intracranial pressure from a head bleed (an operation which can easily be the difference between

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[32] The top medical schools usually included schools in the following cities: Beijing (Peking University, Tsinghua University's Peking Union Medical College), Shanghai (Fudan University, Shanghai Jiao Tong University), Guangzhou (Sun Yat-Sen University), or Hangzhou (Zhejiang University, which uniquely teaches their entire curriculum in English and expects students to pass the U.S. Medical Licensing Exam Step 1 at the end of their preclinical training)

[33] See INTERSESSION for a description of China's medical training system.

life and death). He then subsequently sent each of his students to New China Hospital to do their fellowships, and within a few years, there was a neurosurgical department in Tibet.

I am sure this is, to some degree, an exaggeration, but I would also not be surprised that there is a large degree of truth. Up until recently, there were no centralized residency programs: medical students graduated and trained at whichever hospital hired them — if that hospital did not have cancer surgery, you would have no reason to learn it. It was a medical system based on learning what you needed to know and doing what you needed to do, and only now does that seem to be changing. The flipside of this is also true: because trainees at New China Hospital train in very specialized departments, many of the chief residents who graduate from the gastrointestinal surgery division had minimal or no experience with basic operations like laparoscopic cholecystectomies (the removal of a gallbladder, considered an 'entry-level' basic laparoscopic operation for an American general surgery residency).

These discrepancies in training arose because even at New China Hospital, there were no requirements for the structuring of rotations. Dr. Xiao who went through medical residency in both America and China described her experience as the second class of formalized residency in China.

> Back in my time – and things have changed, I know – there were no structured rotations - you could see zero patients during your rotation and do 100% research if that was what your mentor wanted you to do, as long as you did one year of chief residency and even in that year of chief residency, it wasn't set what they would have you do.
>
> It's very different in the US. The residency training is standardized across the country they make sure no matter what institution, you meet a certain standard. You are required to have a certain number of hours of teaching, of outpatient clinic, of inpatient time. In surgical specialties, there are certain operations you must be able to do independently, and each year you have to report how many cases you have done.

She echoes something I heard multiple attendings tell me: that in America, even though there are very elite schools, there is a sense that there is a guaranteed standard across the board. Having a medical degree from any institution in America ensures a certain expected standard. This is in stark contrast to the Chinese education system which is notoriously myopic in its conception of "good schools" (Peking University and Tsinghua University occupy the same sort of unparalleled reputation as Oxford and Cambridge); amongst medical schools, West China is one of the best, and it is assumed that training there guarantees a certain standard which is not attainable at other training programs. Since there is no regulation of medical training overall — having an "MD" signifies a wide variety of skill sets and abilities across China.

Standardization is at the heart of many ongoing debates in China's academic medical worlds. New China Hospital benefits from the lack of standardization in education and training as their position at the top allows them access to a careful selection of top-tier students and a constant stream of willing labor in the form of graduate students and visiting fellows. Yet despite their benefit, there is a sense of obligation to rectify the disparities in training, to address the issue of heterogeneity of care within the hospital and between hospitals in the region. The

proliferation of cancer surgeries, and specifically laparoscopic gastrectomies provides a case study for the tensions which arise.

> How do we do a good job with the standardization of laparoscopic gastrectomy? Maybe you think we have not done this as well in China but we have actually managed to do this quite quickly …we advance so quickly because we have so many patient cases - but we cannot just do many cases, we have to talk about standardization — we can't just have a lot of cases, we have to do them in a very standardized way. It is a question of standardization and regulation.

Per this surgeon, standardization has happened quickly, and the speed of surgical advancement hinges, once again, on the operative volume of these hospitals. By standardization, he means that hospitals outside of New China Hospital have obtained the necessary equipment (laparoscopic towers, laparoscopic tools, operating rooms equipped with necessary equipment and space) and had quickly ramped up their case counts. Yet it is not enough to have *done* one hundred and fifty laparoscopic gastrectomy operations – these operations must be successful and *standardized*. Standardized in the sense of uniform in quality and in the sense of meeting an (international) standard.

Historically, medicine was taught via an apprenticeship model, its secrets guarded carefully by those who had them and passed down selectively to their students - just enough that the teachers would grow in name and fame but not enough that the students could easily surpass their master. Even within the more modern biomedical system, after receiving a bachelors in medicine, most of one's practical clinical training comes through an informal residency, on-the-ground learning as part of a clinical team, and usually following and learning from one specific teacher for several years before taking on challenging cases of your own. Even at New China Hospital, surgical residents and PhD students train with one senior attending — how much clinical time and what sort of clinical responsibilities they have entirely depends on who they follow and how their superiors judge their progress.

### *Haptics as a barrier to standardization*

Standardization of surgery poses challenges. Surgery is taught and learned experientially; thus, the enduring apprenticeship models of learning. Learning surgery is learning to *do* surgery: it is a bodily training of the hands, specifically, but also of one's senses – learning to see and recognize certain structures and abnormalities, to smell differences in post-operative wounds, to hear the changes in the sound of suction, to feel the pop of a trocar entering an insufflated abdomen or the difference in tissue tensions. These aspects of learning are hard to teach, hard to standardize, and hard to assess: how do you know if someone else recognizes that the tension is insufficient to hold suture? Because standardization of surgical training is challenging, trainees may be kept from operating, a vicious cycle of inexperience and poor training, and a separation from those who can and those who cannot operate well.

Though visiting fellows come to New China Hospital to learn surgery, often what they learn mostly is the management of complex surgical patients. Much of their time is spent on the floor, taking care of pre- and post-operative patients, and even if in the operating room, they are often observing. Few have the chance to actually do surgery because there are so many trainees competing for the opportunity and the PhD students and chief residents (who are most likely to

remain at New China Hospital and therefore are the most worthwhile I nvestments for operative opportunities) are often prioritized. It is also partly because due to the lack of standardized training, there is uncertainty around a fellow's surgical technique and whether he can be trusted to operate:

> In some groups, because of the need for extra hand, [fellows might operate], but in our group, there are always enough people, so they very rarely have the opportunity to do anything. …This has to do with a question of safety… if even the smallest thing happens, the conflict that you will face is really too significant, so for this reason — in the past there have been these issues, where fellows came and they were allowed to do more and then there were adverse events and so now we don't really dare, we really don't dare.

A tight watch is kept over the entire operating team because risk lands on the senior surgeon. At morning report one day, the chair of the department made this quite clear: "Primary surgeons are not saints — we are mortals. If your assistant ties a loose knot we're screwed and we don't even know it." He speaks in response to a patient who had a post-operative leak from an anastomosis site and takes the opportunity to chastise trainees for the loose knots that he has seen tied. A senior attending's assistant in a surgery (the "first assist") could be one of his junior attendings, but it could also be an early stage trainee or a visiting fellow, and the quality of that individual's training or knot-tying can be an unknown entity. The disparity in quality tests the "mortality" of attendings, who can "die" by the sword of their underlings.

The chair noted that from his experiences abroad in America and Europe, (the ambiguous) they "do it better" because they conduct intraoperative provocative leak testing to see whether an anastomosis will hold. Thus, regardless of the quality of their first assist, they see intra-operatively whether the strength of the knots will hold. Surprisingly, rather than calling for intra-operative provocative leak testing (which may be too expensive, too time consuming, or just considered a waste of time), he begs trainees to please tie their knots well, ending with the ominous: "this is how patients die!"

Even junior attendings at New China Hospital are given minimal responsibility, slowly trained under the watchful eye of a senior attending, whose name is tied to every patient in their operative group. Operative independence is not granted upon graduation, a flipped switch whereby all of those who complete their clinical doctorate training are expected to be primary surgeon on operations. Rather, responsibility is doled out slowly:

> If you have done your chief residency year, then you can start to do some of the surgery on your own — like omentectomy, if you can do this part safely, then … and if you can't do this part safely, then the rest of the surgery of course you cannot do basic lymphadenectomy. Little by little.

If you can do X, then you can do Y. If you cannot do A, there is no way that you can do B. On the simplest level, I think of my own entrée into these operating rooms. Passing the first test allows you opportunity to attempt the second; passing the second allows you to observe, then tackle the third.

The first test is really not even a surgical one; the first test is whether you can scrub and gown, whether you come in with your hands held upright, water dripping down your elbows,

whether you can gown yourself and pirouette in the right direction to be tied into your gown. If you can put on gloves without contaminating yourself, your gloves, or the sterile field, you have now earned yourself the right to watch: to be present and to participate in your presence.

I watched new trainees go through these motions, standing at the large metal sinks, sneaking glances at their *shixiong* (older students) to see how quickly or slowly one was supposed to go through the motions of asepsis. Once scrubbed in, new trainees (and I) were given tasks that a scrub nurse or a scrub tech could otherwise do: one's role was always a *double* – not necessary and easily eliminated – unlike the primary surgeon, first assist, or second assist, this role is nameless and extraneous. As the fourth person at the operating table, often your scrubbed in presence is more a hassle than a benefit – you take up space, elbows knock into you, you create cramped-ness and a sense of imbalance.

As a trainee, you are often given metal retractors – molded in different shapes to hold back tissue and provide better visualization to the primary and assisting surgeons: to be clear, retracting is so that *they* can see, not so that *you* can see, and often retraction prevents oneself from seeing into the operative field. Retraction sounds simple, but is both physically grueling and not straightforward: too strongly held, a retractor can rip the liver, too weakly pulled back, and some part of the body will spring back to where it wants to be. There is a universal metal ring retractor system that can be connected to the operating table from which retractors can be mounted, ratcheted tighter and tighter. When the primary surgeons pull out the retractor system, you realize how replaceable you are. Those who cannot be replaced by a metal ring step in closer to each other, tightening the circle around the operative site.

Trainees are given the suction head and told to suction (to clear the operative field of fluid – mostly blood), though you often cannot see where you are suctioning or what you are suctioning and inevitably do it wrong. You will do it wrong. You will be corrected, or chastised, or yelled at, depending on how you frame it. Sometimes, with some surgeons, that is forever where you will remain. The constant testing means that you are doing something right – some senior attendings never give opportunity to try, giving neither opportunity to succeed or to fail. This is a risk calculation, an intolerance of incompetence, a disinterest in teaching or training, or some combination of the above. Those who do provide opportunity dole it out carefully, and sometimes it appears, with little rhyme or reason.

Professor He, despite his gruffness and strictness and propensity to yell (at me or any other trainee) purposefully allows his junior attendings increasing amounts of operative independence. Though he still comes to the operating room for every single surgery, for more untrained attendings, he will be present from the very beginning so that he can micro-manage the positioning of the patient or the exact angle of the incisions. For his more trusted junior attendings, he will come only for the most crucial steps of the operation. Dr. Chao told me about his own growth under Professor He:

> He would wait and join when he felt like he needed to safely, he would observe me and decide at what point he thinks joining the surgery is safe, for example he would join when we get to the splenic lymph node and splenic hilum dissections… and now he'll just wait until reconstruction, and before he might join for the pyloric lymph nodes, and then for the pancreatic lymph nodes, the D2 section, and now if he doesn't come up at all there's no issue, there's really no problem at all.

> It's like this, it's basically like this all throughout the country — the primary surgeon will observe the assistants and know generally what they are capable of, and if they think you are good they'll let you do what they think you're capable of, and if they think you can't, they will spend more time in the operating room monitoring.

One cannot know what one is capable of until doing the surgery. There is no standardized way for Professor He to predict after X number of weeks or months or X number of operations that the trainee will be ready to progress to the next, more complicated step. I sometimes wonder whether a senior surgeon, with more experience and more knowledge can better ascertain whether a junior attending is ready based on seeing multiple junior trainees, or whether a junior attending, with the bodily knowledge of fear or confidence, knows when he is ready. Based on my conversations with Dr. Chao, his perceived readiness was irrelevant: there was no conversation or inquiry – Professor He made the calls, and progressive independence was not always linear.

Corrections and teaching happen in the field. They are often imperceptible to observers – certainly to those who cannot see into the operative field. Only when scrubbed in alongside these surgical teams was I able to hear the quiet critiques and adjustments made by senior attending to junior attending, from junior attending to resident. Even less perceptible were aspects of learning which were purely haptic. Much of surgery is by touch, rather than sight. While it is necessary to know surgical anatomy and its variations, the ability to identify a structure or a vessel is only one facet of surgical familiarity.

Learning surgery is an experiential activity. In my training in America, some attendings called it a "contact sport." They told me that it is like riding a bike, that once you are taught, you never forget, that the rhythm of motions and patterns becomes part of your muscles and bones. Every time I am handed suture to tie a knot, I worry that I have forgotten how to do so. Intellectually I cannot describe the steps anymore, the figure fours or loop patterns I used to learn initially. But, holding suture between my fingers, every time, the motion returns, a knot forms, which I slide down into place with an extended forefinger.

There are many differences between medicine and surgery and many stereotypes which describe the doctors who practice in one field or the other. In medicine, the patient fails or the treatment fails: a cancer patient fails a course of chemotherapy; a new round of immunotherapy drugs fails to relieve the symptoms of a patient with autoimmune disease. In surgery, it is the surgeon who fails. The surgeon is the treatment, the surgeon is the instrument, and the operating room the space through which that treatment is delivered but also where that instrument is made, held under fire and hammered, again and again.

At one of the weekly research meetings I attended, Dr. Wu berates his students for not practicing surgical techniques in their free time. He tells them that back in his day, every chair was covered in suture because during every meeting, trainees were always practicing knot-tying on the arm railings of the chairs:

> One of my colleagues could tie one hundred knots in a minute. Back then, I could do one hundred and twenty. Go home and time yourself and see how many you

can do – now our training time is too short, you do not have enough time in clinical settings, so you have to practice on your own.

Limited time in the operating room means you need to come to the operating room ready: without the ability to tie a knot, you do not have the qualifications or capacity to improve. Dr. Wu is an exception: I rarely heard senior attendings guiding the growth of their students. Rather than warning them to practice more, most would just be disappointed (or angry) if and when a student failed to tie a knot, never explicitly communicating the importance of one's manual skills.

Perhaps this is why it is painful to watch surgeons who are bad at laparoscopy, who fumble with their knots and block their own field of view. There is an inseparability of one's hands from one's ego. The surgeon's ability to deliver treatment depends on the training of his hands and his body, not just familiarity with instruments, a honing of senses, but an intuition that forms, that cannot be easily transferred from teacher to student. The senior attendings all credit their case count for their familiarity: "after you do something hundreds of times, you've seen every possible variation in anatomy, and you know all the ways a problem can arise." How can one standardize something that is so experiential? It is not necessarily about doing one case in a standardized way: it is about doing multiple cases in a standardized way, and recognizing how some cases require a deviation from that standard.

***Mapped and Embodied Knowledge***

While I have not undergone the years of residency and the hundreds of cases, I know as an anthropology student and trainee in surgery that my body is my instrument. There is knowledge that can be read from textbooks, gleaned from a map or diagram, and there is knowledge that can only be known through traversing and experiencing it time and time again. Whenever I see new trainees struggling to navigate the abdomen, getting lost in tissue planes that do not exist, following vessels that are not significant, their cameras rotated such that the horizon is no longer level, I think of all the times I have gotten lost in a hospital: how no number of diagrams or maps could have helped me.

In medical school, I would always get lost in the hospital, and I started going to the hospital early to try to familiarize myself with the space. No one ever drew maps of how to get from the workroom to the operating suites, or from the changing room to the operating room. No one ever thought to, because once you walked it ten times and got lost a few times, one knew the way well enough, and there was no longer any need to draw a map. While spaces frequented by patients and their families (the cafeteria, bathrooms, patient rooms) were clearly marked, with logical signage, there was a hidden, superimposed world of unmarked secret passageways and back staircases which were used by physicians and staff.

I soon found that the best way to find these passageways was to badge through any door that said "DO NOT ENTER," That that signage was for patients and their families, and not for me. That an unmarked door with "STAFF ONLY" meant "ENTER HERE." It was a strange realization, and one of many that felt like a transition in my "professionalization," as I mentally learned to associate myself with "doctors" rather than "patients." I was STAFF, and DO NOT ENTER did not apply to me. My badge, whether or not it was active, meant that I had access - which meant that I could go into worlds that I would not have otherwise even known existed. Access was knowledge, access was power, access was a secret password that I didn't even have

to give. If I wore scrubs, I did not need to have my badge on, and no security guard would stop me. Access was knowing where to get those scrubs.

The first few times I visited New China Hospital, I ended up hopelessly lost, and often locked in stairwells, crying in frustration and sadness and convinced this entire endeavor was a terrible idea. I later learned that the elevators were operated by human beings inside the elevators who coordinated patient transport via walkie-talkies. Staff mostly took the stairs which were cordoned off by badge-access doors. In my field notes, I compared the elevators to the staircases at Hogwarts, which moved seemingly randomly, and sometimes disappeared. It was both a way to keep out those who were not supposed to be there, and a hazing ritual for the uninitiated.

In the nine consecutive months I spent at New China Hospital, I never got a badge, despite various offers to have one made. Dr. Cai, a junior attending I became very close with, had been at New China Hospital since his undergraduate medical training, and he chuckled when I told him I needed his badge to get to the patient unit after a day of operating. *Let me show you*, he told me. *You don't need my badge.* It turns out, most of the doors in the hospital could be opened with brute force: even the ones that would open more easily with badge access would pop open with a spirited hip check. I delighted in this discovery, and especially in the surprised look of residents or fellows who saw this as evidence of my initiation.

These doors, which appeared to be locked but which could be forced open, became a metaphor for Chinese society in my mind. The meaninglessness of rules and barriers, the feeling that because everyone else was doing something, it was a completely reasonable approach. When I spoke to Chinese surgeons, their impression of America (and subsequently, how America differed from China) was that doors had meaning: if you were able to get a PhD, that meant a certain intellectual standard, and not just that you had perhaps bribed your way into a program or that your father knew the department chair. Publications had meaning, titles had meaning, memberships in organization had meaning. Of course, relationships and *guanxi* mattered, but there was a sense that you had to pass a certain bar before you could smooth your way through.

The shoddily constructed doors seemed to be metaphors for the manufactured appearance of a sound legal or administrative infrastructure, which often just required a certain amount of pressure applied in the right places to swing open a tight and apparently locked door. Perhaps they were also a metaphor for the murkiness of standardization, the difficulty of creating guardrails and barriers to entry, to keep the untrained out and only allowing the properly trained to pass. The week Dr. Wu showed me how to open doors was the same week I stopped feeling homesick and started seeing the hospital as my own, no longer reliant on others to literally open doors for me. The ability to open doors, metaphorically or otherwise, had been restored, and I could draw any map I wanted.

My colleagues, fellow surgical trainees in their graduate studies or visiting fellows who were there for longer periods of time, described the same moments of discovery in their surgical practices – moments where a junior attending or senior attending guided them to see how a certain maneuver, a certain way of understanding the anatomy, could re-orient their approach to a surgery. One visiting fellow delighted in observing an approach to lower anterior resections that Dr. Yang liked to do – opening the omentum and following one of the arteries rather than starting with the release of the colon. When given the opportunity to try on his own, he struggled to find the right plane to open the omentum. Dr. Yang, patient, but chuckling, used an instrument to create tension and visualization, revealing the correct plane and point of entry. "Take a picture

here, so you remember how to find this view again," he told the fellow. But the fellow shook his head: "a picture is not going to help me learn this – I just have to keep trying. It is so much harder trying to navigate it – you make it look so easy."

I watched a lot of surgeries to catch a few moments of recognition. Moments where a trainee would receive feedback that made all the difference. A tap on the wrist with an instrument to indicate that one's wrist should be more rotated; a pair of forceps picked up tissue in a way that made certain anatomy visible and clear, their equivalence of being shown a spirited hip check to a locked door. Visualization is the key to much of surgery: whether laparoscopic or open, the ability to visualize haptics, to "feel" the weight and tension of tissue by watching the way it gives or takes with the pull and weight of an instrument: one needs both aspects of feedback (visual and tactile) in order to make the connection.

Sometimes the moment of recognition came in integrating what was seen and experienced in the operating room with other modalities of knowledge. Professor Wu told his students to always return to the imaging, to overlay what they saw in the operation with the imaging viewed prior or after the case:

> Sometimes you will look at it and it just won't make sense, and then after the operation you go back to look at the imaging to make sense of it then. That's how you get better. And that's how your thought process shifts — your logic will have shifted. It will be rare that you make mistakes or miss things. You have a total understanding of each patient's CT imaging, you understand the logic of the connection between what you see on images and what you see in the patient and their pathophysiology that leads to these things that you can see. It's very important to understand the connections of all of these things.

To learn surgery, trainees must be in the operating room, to become good they must accumulate cases, and to become excellent they must accumulate high volumes of cases and see the unusual and abnormal and complex. It was no wonder that so many students and fellows flocked to New China Hospital. While the primary purpose of an operation is ostensibly to remove diseased tissue with the intent to cure disease or improve a patient's life, the purpose of the operation is also to serve as opportunity for learning. Each operation is a training ground, each operating room witness to multiple runs of each training exercise.

In some sense, New China Hospital provided training opportunities, making these complex surgeries and high operative volumes available to more individuals, providing access and raising the standard of surgery technique in the region. However, while individuals certainly were provided with the space to learn (to scrub into surgeries and observed), as made clear through Dr. Chao's experience as a junior attending and the experiences of many visiting fellows, just being in the operating room, even for a few months or a few years, would not change the quality of care delivered at other hospitals.

One of my friends told me a story of a fellow who had come to train in his department, also a specialty surgery. The fellow had come from a community hospital and in his one-year mid-career fellowship, he had really realized the significant differences between his hospital and New China Hospital: the discrepancy in technique, in patient management pre- and post-operatively, and in research. He became invested in many of the research projects, working long hours in the operating room and meeting with professors into late evenings. However, he was

already in his mid-forties: it was unlikely any graduate program would take him. He had only a bachelors in medicine and would never be hired at New China Hospital. All he could do was to return to his hospital, and occasionally visit at New China Hospital to continue learning.

Back at his home hospital, he realized even if he had learned the techniques, he did not have the patients. Even if he found a patient who had the disease he could surgically treat, he did not have the support of other surgeons in his department who lacked the technical expertise to have confidence in him. The same was true of the hospital leadership, anesthesiologists, and even nursing.

Dr. Chao told me that this is the challenge of standardization. While everyone recognizes the need to standardize (to raise the standard for medical care throughout China, to train more surgeons to do operations with a standardized approach), what standardization will take or what it will look like is unclear. Even within the hospital there is significant heterogeneity: "this is what our group is doing, but other groups may be doing something differently and there might be areas where we are subpar or they are subpar but we do not dare discuss these issues." The larger academic hospitals (including New China Hospital) have managed to spread knowledge to smaller community hospitals through weekend seminars and conferences and through a rising network of medical alliances (see Chapter 4), and most at the leadership level felt that this was all part of the obligation of being a teaching hospital.

Many were very interested in a question of standardization especially for complex surgical techniques: how could they (the surgical community) standardize technical aspects of surgery to ensure that everyone who is "qualified" to do a surgery would have the same ability? How should they distinguish between those who have the expertise to operate from those who do not? Is it just about case counts, or is there something more?

Right now, the designation of expert relies merely on the marker of employment: there is an assumption that all West China doctors are experts, even though many of my interlocutors made clear to me that there were certainly those who are better and those who are subpar. Younger surgeons gossiped that some of the older surgeons did not follow guidelines or keep up with research: even if they were well known for being excellent surgeons technically, they operated on patients who did not require operation and they were either too drastic in their resections or too conservative, not following the most recent waves of scholarship which had shifted practice norms. Similar gossip told me which surgeons operated just to increase their case counts, as more reps, after all, were always better.

Outside of New China Hospital, there is a blanket assumption that West China doctors are better than those at community hospitals. Whether this is true depends, of course, on a definition of *better*. By being at New China Hospital, a surgeon has more access to resources and training, a different type and quantity of patients than the population of patients at community hospitals. Could a surgeon not employed at New China Hospital ever have the expertise or case volume or experience dealing with complexities to be "just as good"? Even if a surgeon was capable of doing a surgery, would patients trust him without the West China name? Even if a surgeon could do complex cancer surgery, would their hospital have the ability to provide chemotherapy per National Comprehensive Cancer Network (NCCN) guidelines?

What does it mean to be a good surgeon? Why were so many trainees crowded in operating room twelve that day? To be a surgeon requires being in an operating room. One cannot learn the haptic knowledge of surgical practice without being in the operating room, and while the constant stream of graduate students and mid-career fellows through the New China

Hospital operating room continues, such training is necessary but insufficient. As each surgeon aims to be better, he accumulates cases counts and case complexities, experientially learning through repetition at the only training ground where this is possible. Though each surgeon individually strives for distinction against his peers, this community of academic surgeons also strives for collective distinction, as a hospital institution and as a nation.

Standardization, despite its many challenges, is a representation of this goal: the desire to raise the standard of care throughout China's medical system. The operating room becomes a theater where this tension is on display. The collective experience of these surgeons is lauded as the strength of China: their perseverance and operative volume, their difference in training compared to community hospitals (or international peers) providing shining examples of China's superiority. Yet while certain differences are operationalized for claims of superiority, other differences are minimized given the challenges of standardization. While differences are operationalized to prove distinction or excellence against the "gold standard," this gold standard may be but a metaphorical shoddy door. In the paradox of operating room as training ground, while difference proves the potentiality of sameness, distinction does not necessitate standardization.

## CHAPTER TWO: THE LIFE CYCLES OF NUMBERS

The inside of the abdomen, to the untrained eye, is a mess of shapes and colors. The larger organs might be distinguishable – the rotund and pale mass of the stomach, the deep-red and textured lobe of the liver – but most structures are identifiable only by those who are familiar, like etymologists who can name the different kinds of moths that appear fluttering around a light-source or geologists who can guess the origin of an ordinary pebble.

As a trainee, the abdomen always seemed halfway between legible and illegible. I knew enough to know that something was significant (especially if those operating were being delicate in their handling of it, carefully dissecting around it and treating it with care) but I was not always certain what it was called or where it would lead or whether it needed to be preserved or removed. I knew enough to know what I was *supposed* to know: the organs and their parts, often arbitrarily divided into numbered or named segments by some anatomist from a different century, the major vessels which led to and from these organs, the pockets of lymph nodes which gathered around vessels. Occasionally the senior attending would quiz me or other trainees, gently picking up a structure and asking us to name it or just gesturing at the screen showing well-dissected vessels and asking us to describe what we saw.

While in the operating room, other attendings would converse with their team or teach as they went along, Dr. He worked in silence and his trainees stayed silent alongside him. The only words that he ever uttered were numbers, stated militaristically like a marching command each time a glob of fat was gingerly separated from its surrounding tissues and removed from the abdomen.

Seven. A fat globule would be handed over to the nurse. Nine. Another fat globule placed on the mayo stand. Eight-A. Twelve-P. Ten. Eleven-P.

The numbers got written down on little paper cards, which accompanied the fat globules sitting on the mayo stand just off the operative field. Each glob of fat was a lymph node, and the numbers stated described the "stations" from which that lymph node came. Lymph node stations correlated with their anatomical location – for example, a glob called out as "ten" by Dr. He came from the splenic hilum. The fat globules, otherwise indistinguishable from their appearance, were thus carefully labeled by their anatomic origin, to be sent off to pathology after the completion of the surgery.

When the full specimen, a large mass which included tumor and its surrounding organ tissue, lymph nodes, blood and lymph vessels which presumably the tumor might have invaded, had been removed, one of the trainees would scrub out of the case, take the specimen and all of its associated individual lymph nodes, each on its own labeled note card, and sit on the floor in the corner of the operating room. Putting down a clean towel on which to lay the specimen, he would proceed to clean off additional lymph nodes from the specimen, carefully laying them in a grid, to later be placed into small plastic baggies labeled with corresponding numbers. Knowing which fat globule came from what location would mean that if one came back positive for cancer, surgeons could predict which other areas might be affected, where the cancer might return, or how to best target additional radiation therapy or chemotherapy.

The numbered lymph nodes have limited clinical benefit: it is unclear whether having positive lymph nodes from station 8 have different prognoses from positive lymph nodes from station 11. However, a surgery is considered "standard" or complete only if a certain number of total lymph nodes are taken out (regardless of their station) – what that number is continues to be

debated, though the number often cited in the Dr. He's operating room was fifteen. Despite ambiguous clinical benefit, these fatty lymph nodes were meticulously removed in each surgery.

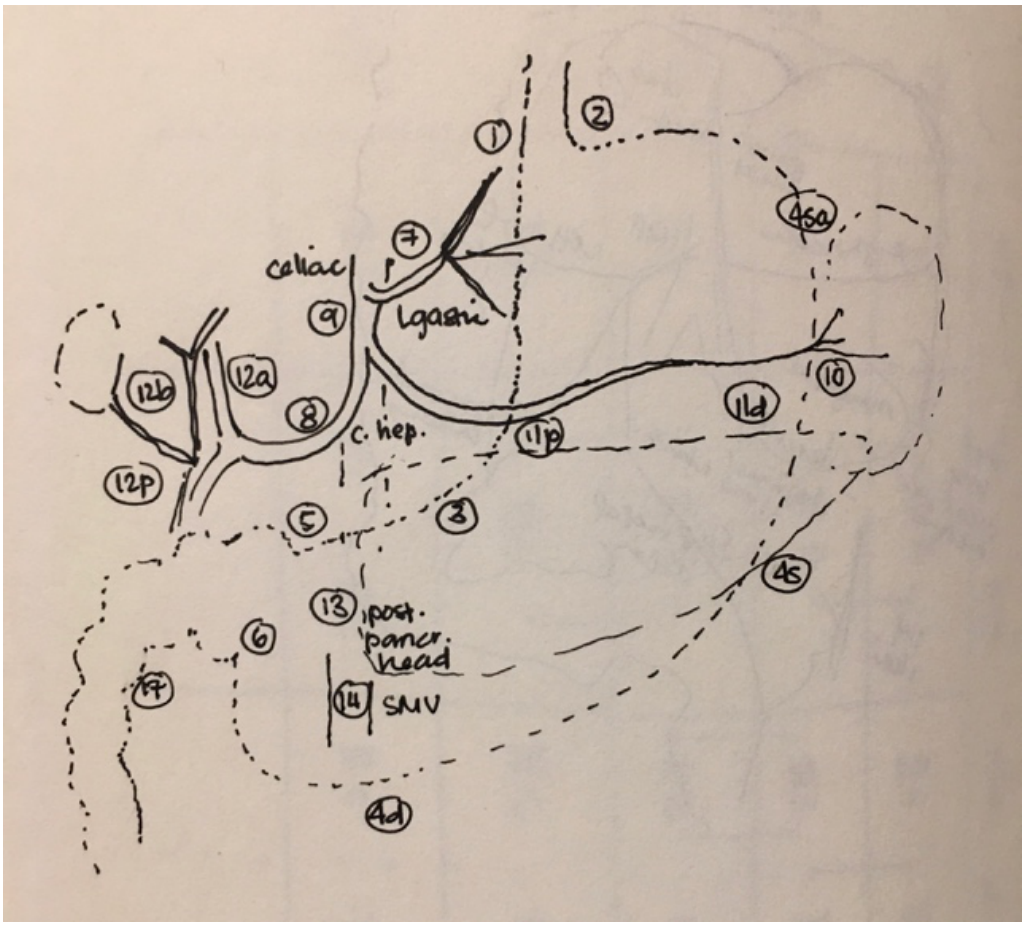



*Image 2*: Lymph Node Stations for Gastric Cancer (from field notebooks)

Each fat globule and its subsequent cell samples were labeled both with its station number (as called out by the surgeon or tagged during the surgery) and with a patient ID to designate which patient and tumor it had originally been associated with. Numbers allow for transformation – for node 11 of one patient to be compared to node 11 of another, whether that other patient is in the operating room next door, or in an entirely different country, or in a different decade.

All of these numbers (lymph node stations, patient IDs, binary 0 or 1 answers to whether a patient had a comorbidity or complication, and a myriad of other measurements and lab results), eventually went into a database, becoming data points which could be translated and transformed. The samples of tissue were processed, fixed in chemicals so that the cells froze in that state and did not disintegrate or mutate further, sliced and looked at under the microscope, preserved for a future experiment, should they be needed. The numbers were similarly fixed in place so that they could not be re-measured or re-gathered or changed, and preserved in an excel spreadsheet, should they be later needed.

This chapter explores the operating room as a site of data production: the data points which are constructed or extracted from surgical operations, which then travel and perform in ways that return to impact surgical practice. The production of data as a focus of the surgical operation shifts surgical practice: the people who are present, the priorities of the surgeons, the care of patients pre and post-operatively, and institutional or industry actors who may be additionally involved.

Datasets and numbers are used to compare between institutions and between nations or regions, to prove distinction. Just as Professor He said "*I bet you've never seen this before*," claiming a difference (distinction) in his surgical ability that showed a retrospective sameness (that he had, already, at some point in the past, been as good as those surgeries I had hypothetically seen), in this chapter, I explore how databases are mobilized to produce an additional pluperfect logic, to make claims about an individual through patterns found in groups of data.

Each aspect of the data collected within a data set is made *fungible* – interchangeable and substitutable, transferable between computers, institutions, or other datasets (Ong 2016:14–15). Ong discusses the importance of fungibility in that it allows the fungible object (in Ong's *Fungible Life*, DNA), to operate within otherwise disparate market, social, or moral worlds. In this chapter, I explore how the fungibility of surgical operations (and surgical patients) as created through datasets changes the moral expectations of what it means to be a good surgeon, and how this moral shift represents two significant changes in surgical practice and the conceptual ideation of patient care: the shift towards standardization of patient care and towards global evidence-based medicine.

While the last chapter explored how the operating room serves as a training ground for residents and mid-career fellows to develop their skills and embodied knowledge, this chapter explores how the operating room serves also as a training ground for a certain type of knowing through numbers, counting, and metrics. To be a "good surgeon" is not just the accumulation of experiential and bodily knowledge: to be a "good surgeon," one must have proof that one is a good surgeon. While proof used to come in the form of gifts from individual patients, *hongbao* stuffed with cash, or large banners made of heavy crimson velvet and gold tasseled rope with black lettering which claimed the surgeon had used their ancient gifts of healing to care for a loved one. Now, in order to be good (and later, to claim that one is good), one must have data. This way of knowing is part of a much larger global trend towards evidence-based medicine and metrics in healthcare research and delivery.

The rise, importance, and critique of numbers and metrics in health, and specifically in global health, has been a topic of rigorous analysis in anthropology, science and technology studies, and other adjacent fields. Counting (populations, bodies, deaths, mistakes, etc.) has long been the fundamental language of science and metrics, as "technologies of counting" (Adams 2016:6) and data, as the organized or transformed result of counting technologies, have transformed science and medicine. The ability to measure or count allows for the possibility of recognizing difference, feedback that allows one to then alter or improve whatever was being measured. The need for numbers creates new forms of authority and power which determine what and who is counted, how such determinations are made, and how the possibility of being counted shapes identities and selves (Rose 2006:28; Foucault 1980).

Recent ethnographic research has focused on the agency of metrics and data in shaping what interventions or research are done in global health and biomedical spaces writ large. Randomized clinical trials, now the gold-standard of understanding the efficacy of medical

interventions, are limited by what is possible to measure and thus narrowly define what claims can be made: "There is a very fine line between *using RCTs to do the sort of health work we want to do and doing only the sort of work that RCTs can be designed to do."* (Adams 2016:44). Researchers, especially in developing regions which rely on help and financial backing from international aid organizations, note that due to funding shortages, metrics and counting determine who is funded and what interventions are funded; thus, numbers are political instruments, used to shift funding towards or away from certain regions or disease categories.

Within a historical framework of global health, numbers are used to prove that a standard is being met, and the purported universality of metrics are fundamental to their appeal: "metrics were a morally aspirational undertaking: they offered the possibility of shared conversations and shared bases for comparison, of revaluation, for stabilizing the truth around complex assemblages" (Adams 2016:20). Counting is, of course, deeply political – numbers are made to speak, certain variables are determined to matter while others are considered irrelevant, certain numbers circulate more easily than others. Adams (2016) argues that numbers are not only not neutral because they can be used for political purposes but because they (falsely) claim to be politically neutral.

Building on these debates, in this chapter, I discuss how data produced in surgical operating rooms are used as proof of distinction: not only in the results of the data themselves but in the ability to collect data and numbers. While metrics have been seen as a means of transcending the boundaries or politics of the nation state, this chapter presents a return to the political, that while the production of the number maintains the appearance of neutrality, the *ownership* of numbers or datasets is clearly claimed.

### *The birth and death of numbers*

I often felt like I saw the numbers at their birth and in their end of life – as they were born, lifted out of the abdomen, read out by a surgeon, entered into a database, and as they came to serve their purpose in their near death – in an excel spreadsheet, run through algorithms, and shown in some transformed state on a PowerPoint slide to be analyzed into a narrative in a paper manuscript (see Chapter 3). Sometimes, numbers were given second chances at life, brought out of a database for a secondary analysis, returned to prove a certain point.

The pluripotency of data is part of what gives numbers so much potential: numbers are collected without necessary foresight or knowledge into what purpose they will serve, and even after a set of numbers served a certain narrative, there is nothing that prevents them from being used for another analysis down the line. The radical possibility of the undifferentiated defines the pluripotency of data (Ong 2016:12), but just as stem cells require certain media and factors and specific environments and attention in order to grow (and just as factors determine how stem cells differentiate), the unleashing of data's potential requires similar coddling. The push for evidence-based medicine is one aspect the environment necessary for numbers to thrive: an environment which values numbers and their collection in order to compare one set of numbers against another, and implicitly, to compare the owners of one set of numbers to the owners of another.

Numbers, databases, and metrics take form and are present in the operating room space, and the operating room has become the space where acts of collection, transformation, and comparison make numbers agentive, and the theater and field wherein these numbers operate. In order for the operating room to serve such a role, technologies, surveillances, and international

structures make the work of such databases and metrics possible, as well as making possible the futures which these numbers and data points promise and portend.

Data points and metrics are an everyday part of a surgeon's life in China. Every day at morning report, the unit nurse begins by listing the total number of patients admitted, discharged, and in each unit, the total number of patients over the age of 80, the number of patients whose length of stay exceeds thirty days, and the number of patients who owe over 20,000 RMB in fees. In weekly meetings, individual surgeons are publicly named for exceeding or meeting certain numbers of cases, discharges, or ICU admissions, and surgeons collect metrics on their own cases, tracking patients in databases that extend back decades.

But numbers are not always so simple. At a local multidisciplinary conference, Dr. Chao tells this anecdote to a couple of community surgeons from a hospital hoping to learn from New China Hospital's clinical research models:

> Once, at an international conference, a Korean expert asked what was our rate of post-operative fever. I was so embarrassed because I had no idea. I had to do a retrospective chart review to find the answer – 24%. He had said his was 30%. Does this mean we are better than them at preventing fever? Or does it mean that they are more detailed in their data collection, or that we categorize patients differently?

Numbers, and the comparison between certain numbers, are agentive in creating shame or pride, in shifting practice and questioning knowledge, in making claims of truth.

Numbers are a form of "difference that makes a difference" (Bateson 1972:318), a unit of information, the observable amount of change: between one lymph node and two, between a segment which is 1.2 mm and 1.3mm. As Latour argues in his seminal text *Science in Action* (1987), scientific literature is defined by a most obvious trait: "the presence of numbers, geometrical figures, equations, mathematics, etc." (Latour 1988:61). Numbers are powerful because they allow for "cycles of accumulation": marking something in such a way that it can be marked again, or such that the marking can be understood as a sign of the original thing by a second observer. Numbers stabilize an otherwise ephemeral moment: an assemblage of the right people in the right moment with the right equipment within the right buildings allows for the removal of the lymph nodes in a way where their significance is not lost. This stability gives numbers their fungible quality as "immutable and combinable mobiles" (Latour 1988:227) and their combinability, transformability, and scalability.

The retrospective chart review that Dr. Chao mentions is the basis of much of the existing clinical research that happens in New China Hospital. Though the electronical medical record that New China Hospital uses is clunky and a synchronic (each patient encounter is a separate patient encounter which is not easily tied to previous or future encounters along a diachronic axis), it is possible to pull every operation one has done, and the full text of the admit note, the progress notes, history and physical, and discharge summaries. However, to extract data from these notes is a time-consuming process (for which undergraduate medical students are often hired, to read through notes and to pull out relevant data points to populate a spreadsheet for a given research question.

Thus, there is a move to attempt to create these databases prospectively, entering each patient in as they are admitted to the hospital, and following up with them at certain time points (one month after operation, one year after operation, etc.). The guidelines around research consent are not always clear (see Chapter 3) and I am uncertain whether or not patients provide blanket consent regarding the collection of their data at hospital admission amongst the stack of forms to be signed. How their data will be used (and how anonymized the data will be) may depend on the database, though no patients ask about this data collection during informed consent conversations.

Several of the research groups in the department (specifically those of Professor He and Professor Wu) have their own databases, excel spreadsheets of every gastric cancer patient or rectal cancer patient that they have operated on, with set columns for entering in their relevant demographics, pre-operative symptoms (binary yes/no, did the patient have nausea, fever, pain, etc.), past medical history (binary yes/no, does the patient have comorbidities such as hypertension, diabetes, etc.), certain features of the operation (length of operation, estimated blood loss, number of lymph nodes removed and which ones etc.), features of the removed sample after undergoing pathological analysis (cell type, number of positive lymph nodes), post-operative complications (yes/no, did the patient have post-operative fever, wound dehiscence, swelling, etc.), and relevant information from follow-up visits as well.

The need to extract data from each surgical patient shifts how surgical practice takes form. Graduate student trainees are present in the operating room solely for the purpose of receiving, organizing, and labeling the specimen and lymph nodes which are removed. It is an arduous and difficult task which necessitates a thorough understanding of both the surgery itself and the anatomy – any misunderstanding would lead to a mislabeling of the specimen and error in the data. The specimen, once removed from the body, loses the usual anatomical markers – only those who are very familiar with the organ anatomy, the lymph node stations, and the task of lymph node removal and labeling, are able to orient the specimen, keeping its bearings of anterior/posterior, inferior/superior.

While surgical operations aim to remove diseased or damaged tissue to heal or alleviate suffering in a patient, in certain operating rooms, the patient is seen and treated as a research subject (object) in addition to (or instead of) a patient. The dual roles of research subject/patient are also intricately intertwined. Do surgeons do a complete lymphadenectomy for the sake of completeness for a future research paper, or for the sake of a patient's best chance of survival for this stage of cancer? Perhaps the guidelines indicate that eleven to fifteen lymph nodes should be removed. Do surgeons remove twenty, hoping to show with this data that more lymphadenectomy is conducive to comparatively improved morbidity or mortality?

Ultimately, the push to create data from surgical operations is part of a larger pressure to participate in evidence-based medicine, a trend or ideal which circulates on an international and global stage. Evidence-based medicine or evidence-based practice describes the use of research based on large datasets (e.g. clinical trials) to make clinical decisions for individual patients. Throughout my time in operating rooms and in morning reports, senior attendings often told junior attendings and graduate students not to "waste" cases and case volume. Each patient was part of a body of cases (case volume) which needed to be mobilized for other purposes. It is not enough that the trainees are saving a patient's life (or at least attempting to), what really matters is that that patient's surgery (and someone's experience doing it) is made into something —not just expanding an individual trainee's repertoire and experience (as described in Chapter 1) but

also that each operation is catalogued in such a way that it is fungible, able to be transformed into a research statistic, a trial, a publication, and eventually, an improvement in the ranking of the hospital and in China's stature from the global standpoint. The following sections explore the *morality* of data collection as well as the national ethos and focus on data collection within the framework of technonationalism.

***To be a good doctor, you need data***

On one of my weekends, I was texted by Dr. Chao that I should consider attending a summit on the management of multi-disciplinary trainings for gastrointestinal cancers that their department was hosting. I arrived early and eventually found the conference room in a different section of the hospital than I usually frequented. The room was at the end of a long hallway, which depicted photos of New China Hospital's history: its founding by missionaries, their original operating rooms, a photo of an early operating room with seven or eight people around the operating table and a few anesthesiologists watching.

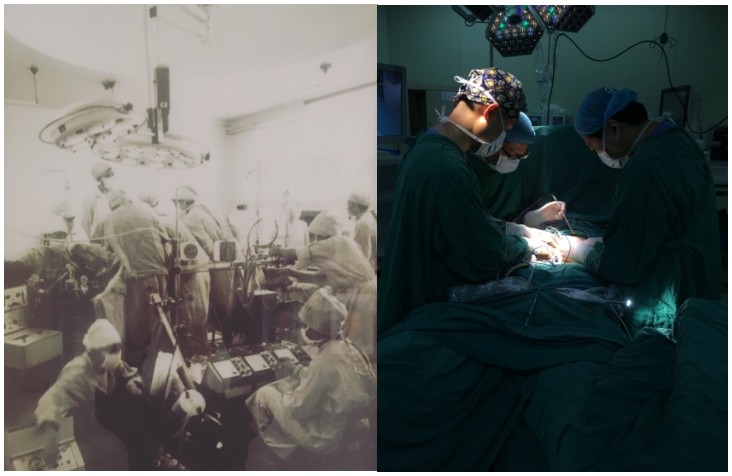


*Image 3*: Photographs of New China Hospital's operating room (Historical and Current)

Slowly, professors and doctors (oncologists, surgeons, radiologists, pathologists) from a handful of cancer-specialty hospitals from various regions in China trickled in and took their seats behind their placards, which displayed their names, titles, and affiliations. To open the weekend summit, Professor He spoke passionately to the group about the need for forming multi-institutional and multi-disciplinary databases of cancer patients.

> What does it mean to be a doctor? You can do a surgery well: your technique is very good. Does that make you a good doctor? If you think what you're doing for the patient is good and you end up killing the patient, you are just falsely standing under the halo and protection of the title of being a doctor.
>
> As a doctor, we have to follow guidelines and the existing knowledge that we have in the present of how to treat the patient. But after you treated the patient, what happened to that patient? What was the result of your intervention? Do you

> know? If you don't know, how do you know whether you were a good doctor? **This is what China lacks.**
>
> What you're doing: is it a good thing for the patient? That's the question. We all want to help people, at the core, that is what it means to be a good doctor — that's why we went to school. But then we work for a while and we become like this – we stop asking this important question. A lot of things seem easy until you try to do them — we can't do these studies without databases, and it takes decades to collect this data.

Professor He ties the *morality* of profession of medicine to knowing guidelines and to having rigorous systems of follow-up. To be a good doctor means not just seeing a patient at one time point, but to recognize the importance of continuity of care and longitudinal follow-up: a shift from a synchronic to diachronic or dynamic perspectives of individual patients. He also ties the morality of the profession to clinical and scientific inquiry. In order to be a good doctor, one must engage in communal curiosity and introspection, to continuously ask oneself: is this good for my patient, how do I know, and how do I do something even better for the patient? These points, while seemingly simple, reflect a significant departure from the lived experiences and priorities of most physicians at New China Hospital, where patients are seen as a single time point rather than a longitudinal relationship.

Given the high patient volume at any outpatient clinic and the absence of an integrated electronic health record, each patient is seen as a single time point. While physicians may ask what studies have been done in the past, it is up to the patient to know their own medical record and produce its evidence: patients walk around the hospital with large plastic sheaths carrying print-outs of their CT or MRI scans, one of every few slices printed out so that a grid of 60 images fits on a large dark film. Patients show up to clinic with large folders of their records, if they have them: discharge summaries, blood counts, endoscopy reports. Some patients just have a single paper with the results of a study that they need interpreted. Rarely does a physician bring up electronic medical records on the computer –records from prior hospitalization are not easily accessible and patients are often asked to go themselves to the medical records department with their patient ID card and request a print-out of admission or discharge summaries in order for physicians to learn about prior hospitalizations or interventions.

Thus, in the outpatient setting, after the physician evaluates the patient, states his verdict, and sends the patient on the next step, that patient could be gone forever. There is no follow-up on the patient, the patient is not entered into some record. There is also no expectation that the patient will follow-up on the advice of the physician, whether or not the patient gets a laboratory or diagnostic test or returns is up to the patient. If the patient wishes to return, he will make a follow-up appointment and see the physician. The patient will say something along the lines of *last week you told me to get the endoscopy and I got it, so here is the result.* It is not up to the physician to follow-up: it is up to the patient to return.

This means that there is no mechanism to know what happens after an encounter, whether an outpatient clinical encounter or an inpatient surgery. While patients are *scheduled* for post-operative care, some patients never return, not wanting to drive the distance and going to their community clinic or hospital to have staples or sutures removed and wounds checked. In these scenarios, New China Hospital has no way to know whether the wound was infected or whether the patient became septic and died.

Community physicians who see post-operative patients from New China Hospital do not report back to the operating surgeon: there is no centralized medical record, nor is it custom to write a letter to the referring physician, as one might see in American medical practice. In fact, community physicians note that New China Hospital surgeons have no idea how well or how poorly their patients do because so many of their patients come from far away and do not return for post-operative care. One community surgeon I interviewed expressed with frustration that New China Hospital surgeons are not as good as they think they are – that they cherry pick their cases and that many of the complex post-operative complications would show up in the community hospitals:

> I wish they would just come to us – I see so many of these messed up operations, wounds that dehisce or bowel perforations and then it is so hard to re-operate in these abdomens. They have no idea because these patients aren't going back to New China Hospital after the surgeon messes up!

It is of course, not this simple: New China Hospital surgeons are neither technically perfect nor across-the-board flawed. But the community surgeon's frustration reflects that the lack of patient follow-up or centralized system challenges an individual's ability to *know* the impact of one's surgical intervention. Professor He argues that it is one's moral impetus to shift from seeing one's role as a physician to a patient for this moment in time – a model where one is called to consult on the patient's needs and to provide an immediate service in interpreting his imaging findings or doing a surgery – to seeing one's role as a physician to this patient long term, for his entire disease course, from diagnosis to death, pre-operative to post-operative management, including coordinating the patient's multidisciplinary cancer care requirements with medical oncology, radiation oncology, pathology, and radiology.

Professor He, in a later conversation with PhD trainees about the importance of contributing to these databases of patients, stated:

> If you do not care about the outcome of your patient and only care about the immediate completion of the surgery, you have no reason to follow up to see whether the patient has died or how long the patient has survived for.

Though he does not name names, Professor He seems to speak of several colleagues, within his own department and certainly outside of the academic setting, who are stubborn in adapting this perspective. Surgeons are not incentivized to follow up on patients and to do so requires time, patience, and meticulous organization. Surgeons are paid per surgery, and as long as the patient and family are satisfied and pay the price of the surgery, the transaction is complete. While Professor He makes claims for the *moral* imperative of "[caring] about the outcome of your patient" (in order to know whether you are in fact a good doctor), for others, being a good surgeon means doing a surgery quickly and with low costs.

One surgeon in particular is known for the speed with which he does open colectomies: less than two hours is normal for him, and occasionally he does them in under an hour. This means that even with the necessary turnaround time between cases in the operating room, he is able to operate on eight to ten patients a day. Many trainees come to learn from him, to marvel at his speed and technical dexterity, the precision with which he cuts and removes diseased organs.

From incision to closure, every movement is efficient and well-rehearsed: there are no wasted movements, wasted dissections, or wasted knots.

But behind closed doors, his peers question whether this version of operating still works in academic medical centers. *He cannot possibly be doing a complete lymph node dissection and lymphadenectomy.* If the diseased colon is dying because of ischemia, this is not problematic, but if the patient has colon cancer, the approach to the surgery matters and has mortality consequences. But if the patient and their family are satisfied – the diseased colon has been removed and quickly (because this surgeon can fit many patients into his operative schedule), do they know that with another surgeon, the survival might have been different? The reality is, that statement may not even be true: the crucial thing is, because this surgeon does not collect (or has not shared) longitudinal data on his (many) patients, we cannot know.

The shift towards longitudinal perspectives of healthcare occur within a larger context of changes within the Chinese healthcare system and ongoing tensions of patient-physician mistrust. The quality of care is increasingly scrutinized, both in court through medical-legal disputes and through media or the questioning of patients and their families. This scrutiny affects how medical records are kept and how conversations are documented. Additionally, as medical care has improved over the past decades and perhaps more importantly, as public knowledge regarding medical care and general health literacy has improved, patients *expect* to survive and to stay in touch with physicians and medical care is seen less as single-time-point transactions made between disparate care providers and more as potential relationship-building. Some physicians purposefully create long-lasting relationships, adding all of their patients to a WeChat group such that patients can form relationships with other cancer survivors and ask questions about post-operative care and support each other.

Keeping in touch is the first step to knowing what has happened (how do you know that the surgery went well if you do not know whether the patient is still alive a few months later?). However, the move from individual patient follow-up to patient databases reflects an additional change: the shift towards evidence-based medicine and standardization.

### *From Apprentice-model to Data-driven Healthcare*

While the shift to longitudinal patient care allows a surgeon to know whether for a single individual a surgery was successful (by whatever metrics define success), how does a surgeon know whether the specific surgery he did works overall or is the best possible surgery? How does a surgeon know whether to utilize one approach over another (open vs. laparoscopic? D2 vs D3 lymphadenectomy? Surgery before chemotherapy or after?), and what the effects are for one population over another?

Professor He in his opening comments above notes that the most important question a (good) physician asks is whether what you are doing is a good thing for the patient. How does one know, before trying it on that individual patient? Guidelines, evidence-based medicine, and randomized controlled trials (RCTs) attempt to answer these forms of questions, telling physicians that based on trials or observation, for X population of patient, Y is a superior intervention over Z, as seen in decline in mortality and morbidity overall, thus Y is the recommended treatment for X.

Guidelines and decisions on whether to operate or how to operate based on guidelines and evidence mark a significant departure from the apprentice-model and experiential surgical

practice described in the prior chapter, which still forms the foundation of surgical training. Whether in my American training or during my time in China, if I asked a trainee why they used a certain type of suture or managed a surgical drain in a specific way, most could give me the logic behind a decision, but conceded that they followed the habits and preferences of their seniors. Rather than following the advice and experience of an older individual who has "seen it all" over decades of practice, within this a new data-driven model, surgeons follow the guidelines which are based on collective evidence amassed from one's present-day peers.

This data-driven model threatens the centrality of the surgeon-sage, the charismatic teacher-mentor who collects and cultivates generations of student-followers, carefully selected from the masses who wish to join. Guidelines are equally accessible by all, published in open-access journals: one does not need to know the famous surgeon who writes the paper in order to practice the knowledge espoused through guidelines. One community surgeon used this fact as a reason why he did not feel he needed to spend additional time training at New China Hospital: "we read the same papers here. We see the same guidelines. We make the same decisions they do – sometimes we follow the guidelines more than they do. I know that at New China Hospital, there are surgeons who flout guidelines because they still follow their old famous teachers." No longer drawn to a "cult of personality," surgeons appeal to numbers, which have gained a similar halo of opaque impenetrability.

This shift from the traditional apprentice-model of surgical training to evidence or data driven model changes not only how one makes decisions regarding treatment or intervention and how one sees one's own patients: not just as the implementation of these data-based guidelines for intervention, but as data points in the creation of future data-based guidelines. In order to be a better doctor, Professor He argues, surgeons must see the patient not as an individual case, but as one part of a much larger database of cases which together tell a story and instruct the collective community of surgeons on what they should or should not do.

To care about a patient is to do what is best for them: to do what is best for a patient or for an entire population of people who might have this disease, one must know what is best. Abiding by algorithms and "doing what is best" is a form of care: attending to only what affects decision making within algorithms supposedly provides the best outcome and providing the most efficacious intervention *takes* enormous care and is a form of providing care. Thus, collecting data in order to reveal patterns of outcomes that cannot be revealed through a single individual patient is also a form of care for future patients in one's own practice and in the larger (arguably global) healthcare community.

While Professor He identifies this call as a moral one, the drive for data is also associated with modernity and ethos of cosmopolitan science. There is an implicit association between the apprenticeship model and older forms of training and medical sciences, and an association between evidence-based medicine and modernity (more here). Thus, Professor He's claim that China *lacks* this attentiveness to clinical guidelines (both their effect on treatment decisions and the production of data that leads to changes in them) is also a claim of China's backwardness and a need to adapt this new perspective.

In describing this attentiveness towards guidelines as what China lacks, he does not describe it as what *cancer hospitals* lack, or what *New China Hospital* lacks. Having traveled through many hospitals in China, doing surgeries as a guest at many of them, this has been his position for the past few years: that what *China* lacks is an attention to data and data production. At multiple of his lectures, whether his audience was community surgeons or academic trainees,

whether video-recorded and streamed to tens of thousands of virtual attendees or in a cozy conference room with just a few students, Professor He preaches the importance of guidelines and databases. And under his guidance, over the past decade, his operating room has become a site for data production just as much as it is a site for disease removal: both are intimately intertwined.

This approach shifts the focus of surgical practice and demands careful creation and extraction of data points for a database that must be manually curated. After the summit, Dr. Chao explains to me that this perspective, which he feels he aligns with after following Professor He for several years, creates a completely different approach to patient care and understanding of one's responsibility as a physician:

> If you take every patient case and treat it as a research data point, then you will be complete about your data keeping. But in the hospital, we just care about what is minimally necessary for clinical care, what will allow this patient to get better and be discharged. … Our doctors who are here, their sole goal is to improve their technical ability in surgery: how can they get better at surgery? And this data is not important to them — they can't use it and they aren't able to see that it might be useful or important for something bigger.

Per Professor He and Dr. Chao, surgeons who focus on clinical training (the haptic experiential training described in the previous chapter) have yet to recognize the bigger picture: whether what they are training to do is even the correct approach, and how to continuously consider what may be a better approach. What are the questions we *should* be asking about patient care?

When Dr. Chao says "we just care about what is minimally necessary for clinical care" he refers to the incompleteness of patient charts compared to cultivated databases. As Dr. Chao says, to collect "complete information" on a patient (to have not just their age and gender, but their tumor stage, their CT scans, their EUS biopsy results, their pathology specimens, their past medical history, and various factors of their surgery) makes each case mobile and comparable — to not only allow each case to be something one can learn from, but to allow the data at New China Hospital to be compared to the data at a different university, for data from this institution to be compared with data from a Korean institution or Japanese institution or American in a way that is meaningful.

He later talks to me about the results of a paper comparing gastric cancer surgeries at their institution to gastric cancer surgeries at an institution in Korea.

> This is one of the comparison papers we did between our data set and a large hospital in Korea and we found that there aree actually really significant differences in the proportions of patients that we see in late stage disease rather than early stage disease — our stage III is so much higher than theirs, and their stage I and II makes up a huge proportion of their patient cases. And our stage IV cancers, we are still operating on them! Even though we know with this prognosis we should not be operating! … There are still a lot of non-standardized aspects to this, like the pre-operative analysis might not be accurate and even after we know that we shouldn't be doing the surgery we are doing it anyway — it's a question of compliance, really, by doing this analysis we are able to find these problems.

In order to make these comparisons, one needs to have collected the data. The challenge with creating databases is that this is not something one can do halfway — so much can shed doubt on the "incompleteness" or problematic nature of a dataset. To collect numbers perfectly would produce a good; to collect numbers imperfectly would produce harm, to create shame – some individuals prefer to stay away from numbers, not risking anything for a potential good.

Dr. Chao notes that ideally there would be better patient follow-up, but that "in China we just don't have the resources – the human resource to do this. And our clinicians and residents don't have any interest in this." He notes that speaking to colleagues who work in America or Europe, or from his own experiences in Germany, due to a smaller volume of patients (and smaller volume of clinical duties), surgeons and trainees, or assistants (nurses, physician assistants) can maintain these databases. More importantly, perhaps, is that there is longitudinal follow-up through electronic medical records and patients being lost to follow-up is an abnormality rather than the norm.

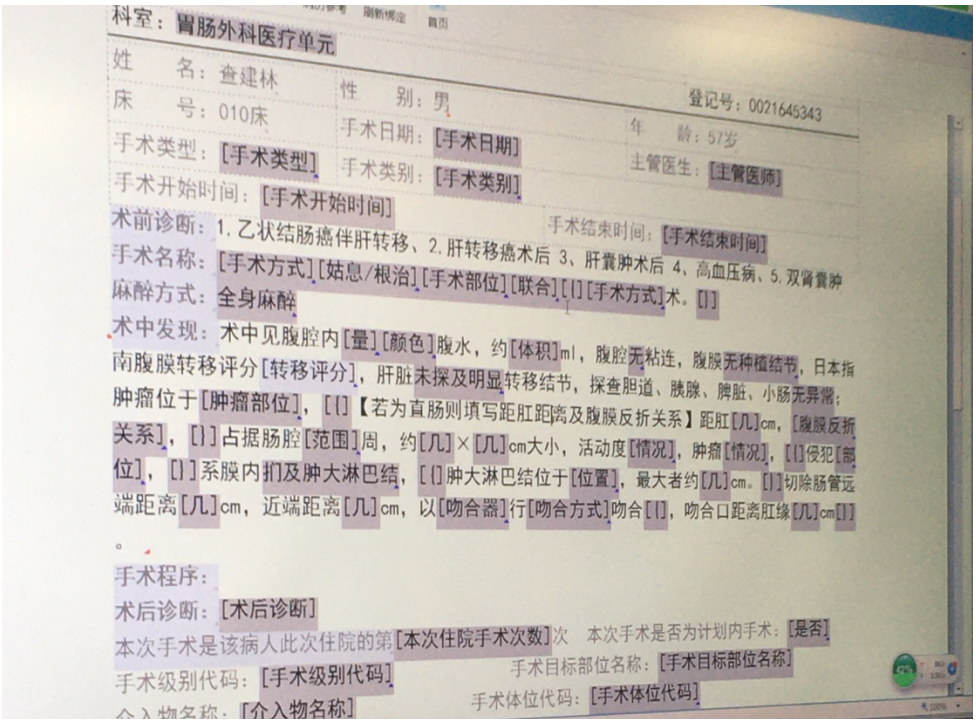


*Image 4:* Template for Patient History as shown during Morning Report

A few months after this summit, one of the other senior professors (Professor Wu) created a template within the newly updated electronic medical record for every rectal cancer patient who is admitted to his service. Modeled after a usual history and physical, it included information about the patient's demographic that would normally be included in a patient note (age, sex, BMI), as well as detailed boxes for the patient's cancer symptoms and history. Rather than allowing trainees to fill it in with free text, each section was a series of checkboxes: forcing choices of whether or not a patient had these symptoms, certain lab values, past imaging, family history, etc. While there was still room for free-text to describe symptoms or provide additional information, the framework forced trainees to ask certain questions and to provide fixed answer from a closed set of options. The entire template took up two pages double sided with dense text.

Trainees were immediately disgruntled, saying that this was much harder than their normal history and physical and that it was a waste of time to have to fill out this new form.

I happened to sit next to Professor Wu when one trainee voiced his feedback, that clinically a lot of this information was not relevant for the surgical team to decide whether the patient would receive surgical intervention. Professor Wu, noticing my interest, showed me the form. Without thinking, I responded: *great for research though*, and Professor Wu laughed. "See, she gets it," he says. Though a human would still need to input the results of this form into an excel spreadsheet, this could eventually be automated, and Professor Wu will have created his own database with all of the variables he might want to study in the future.

Amidst the shift from apprentice-model training to data-driven decision making, surgical professors who retain their charismatic prestige have incorporated data and access to data into their training circle. Their students have access to their databases and can publish from them, they mentor students to think and operate with guidelines in mind. While in the past, surgical professors were sought after for access to observation or participation in the operating room or contacts with other professors at other institutions, professors are now known for their databases, their data analysis training, and their access to multi-institutional collaborations.

For example, Professor He has been collecting data on his own surgical patients, forming one of the earliest databases of surgery patients in China. Decades ago, he biked to villages to follow up with patients; now, twice yearly follow-up on thousands of patients is made easier by WeChat and other technologies. But though he pushes for surgeons at WCMC or other hospitals to build their own databases, few if any have taken up his charge. As his students (many of them now junior attendings themselves) tell me, he is obsessed with numbers and the things that numbers can prove. Those who join as students of these professors, must also take on their call, to see patients as data points within databases.

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To me, of course, it is amusing that Dr. Chao imagines and advocates for a future where doctors treat patients more like a data point and not just like a clinical patient to be treated or dealt with in the moment. In my medical training in America, many trainees speak about wanting to treat patients less like a conglomerate of numbers and more holistically like a human and not just a disease: "*treat the patient, not the numbers*!" I often heard while on clinical rotations, to remind us as students not to fixate on addressing an abnormal lab value, but considering the abnormality in numbers in the context of the larger and more complex patient picture. Despite this call for a holistic approach, our electronic medical records provide more and more detailed and elaborate datasets with every possible measurable and quantifiable value.

But I understand that Dr. Chao is advocating for physicians to recognize the importance of data, and the importance of their clinical practice as a site of data production, whether they are surgeons or internists or pathologists. For Professor He and Dr. Chao, seeing a patient as a dataset is a calling and part of one's duty as a physician, to utilize the opportunities provided. It is a trope that the strength of China is in its numbers (see Chapter 1 for a discussion of operative volume); yet all of this "volume" is wasted if each clinical encounter only benefits a single trainee and. is not transformed into data points to be understood, interpreted, mobilized, and compared across geographical and temporal scales. Dr. Chao wants his trainees and colleagues to shift their perspective on their clinical practice from clinician to researcher, to create data, to participate in data production in order to be visible, in order to matter.

The point of data is comparison: to compare one individual case with another similar one, to compare one set of data with another, whether it is to compare treatment type A with treatment type B, to compare a present version of a patient with a future or past, or to compare one institution with another institution, or an entire country with another country, another region with another region. Because what is the point of being excellent if no one acknowledges your excellence? If you produce a single excellent case, it means absolutely nothing.

Thus, patient database also produces a pluperfect logic that shifts temporality of knowing. A single patient who receives a given surgery can be followed for several months and several years: if the patient does well (does not have a cancer recurrence, does not have complications, and lives), the surgeon who did this surgery might decide that that surgery was an excellent surgery. However, without multiple patients who are similar in characteristics and which receive the same given surgery, there is no way to know whether that first patient was a fluke, whether the patient would have survived just the same without the surgery, or if, in fact, the patient would have lived even longer without the surgery.

The same applies if the patient had a poor outcome (a complication or even a death). If of that one hundred patients that a surgeon treated with a standardized surgical intervention a smaller percentage of patients had a complication compared to a group of patients who received a different intervention (or even the same intervention delivered by a different surgeon), the poor outcome for a single individual does not negate that that treatment could still be the best and correct thing to do, given the current state of *evidence* amidst a global surgical community at the current timepoint, and given also what one is capable of as a (technical) surgeon and as an institution. It is only through the collection of *multiples* of the same mutable, comparable, and translatable surgical practice, and looking at populations within databases that one can retroactively prove something about an individual case. Distinction is retroactively determined through comparison against a standard which arises only through group-level analysis.

***Data as transformed to guidelines***

Numbers, as data points, have the possibility to coalesce and become something bigger, something more meaningful. While one number may not tell a story, many numbers tell a story and increasingly so, stories cannot be told without numbers. Guidelines, which are born out of numbers told within narratives, have the potential to shift practice for individuals, institutions, and nations, and the creation of guidelines comes with power which is sought after by individuals, institutions, and nations. In 2012, fourteen hospitals across China joined together for CLASS-01: a multi-center Phase III RCT comparing laparoscopic vs. open D2 gastrectomy surgeries for locally advanced gastric adenocarcinoma. This trial was the first large-scale multi-center phase III RT in the gastric cancer surgery field, and was the result of a decades-long push towards this sort of research initiative.

In the field of gastric cancer, guidelines released by the Japanese Gastric Cancer Association are gold-standard for evidence-based management, dictating when surgery should be done and what that surgery should entail. A “D2” gastrectomy describes the extent of lymphadenectomy: which lymph nodes should be removed and evaluated for the presence of cancerous cells. Japanese surgeons pioneered the D2 gastrectomy, showing mortality improvement with this “extended” lymphadenectomy (Sasako, Sana, Yamamato et al, 2008). Though the Japanese guidelines recommend laparoscopic D2 gastrectomy only for early stage

disease (Yasanuga, Horiguchi, Kuwabara et al 2013), Chinese gastrointestinal surgeons are known to perform the "big whack" laparoscopic D2 gastrectomy surgeries for later stage disease as well.

The CLASS-01 trial highlighted a lack of adherence by Chinese surgeons to evidence-based Japanese clinical guidelines, which recommend D2 gastrectomies only for early stage disease. Multiple Chinese hospitals collaborated to provide sufficient evidence of the widespread phenomenon of Chinese surgeons using laparoscopic D2 gastrectomy approach for later stage gastric cancer as well, given that over 80% of gastric cancer indices in China are locally advanced (later stage, though not yet metastatic).

It did not surprise me to find out that Chinese surgeons were known to perform laparoscopic D2 gastrectomies against guideline recommendations. A department chair who was visiting New China Hospital as part of a hospital administration training program happened to be observing a surgery in the same operating room as me, and told me:

> Chinese surgeons do the best laparoscopic stomachs surgeries because we have such high numbers and we don't really follow the guidelines — some later stage cancers we still do it laparoscopically — internationally they are probably stricter about not allowing this so we are able to practice and do this better.

His comment reinforces the evidence presented in Chapter 1, that the strength of Chinese surgery is often tied to its numbers; here it is also tied to Chinese surgeons' willingness to ignore clinical and professional guidelines in order to augment case volume. China's biomedical science community is known for its willingness to flout ethical guidelines, whether in controversial stem cell treatments (Song 2017), gathering genetic data (Ong 2016), genetic editing (Cyranoski 2019), or data collection and surveillance (Mason 2016).

Despite Professor He's claims that following guidelines is necessary to be a "good doctor," for many Chinese physicians, following or not following guidelines are often not seen as a question of *ethics* or *morality*. Many other decisions factor into the decision to do a surgery and what type: what equipment is available, whether surgeons are trained to do a particular surgical approach, and patient preference play significant roles. Especially in smaller community hospitals where case volumes are limited (see discussions in Chapters 4 and 5), surgeons seek opportunities to do laparoscopic surgeries, which are seen as more advanced (and can incur higher costs). In my conversation, surgeons rarely seemed to consider that it was problematic that guidelines were not followed: *no one trusts the guidelines anyway*, was one common refrain.

While those who conducted the study hypothesized a deviance from international guidelines, the results of the study were surprising. After two years and over a thousand cases at multiple institutions, the study showed that yes, Chinese surgeons were performing laparoscopic D2s against the international recommendation; however, the trial also showed that amongst these interventions, there was non-inferiority of laparoscopic surgical approach compared to open gastrectomy for (later) stage locally advanced gastric adenocarcinoma (Yu et al 2019). This study therefore both identified the non-compliance with known evidence-based clinical guidelines and possibility that the guidelines were not so definitive. For many, this study provided evidence of the importance of establishing evidence-based surgery in China, to allow the surgical experience of Chinese surgeons to advance the international research agenda: to give voice and impact to the volumes of Chinese surgical experience currently uncaptured.

Throughout the country, researchers are beginning to recognize the power of "big data" or "big databases" to bring attention to superior medical or surgical management of disease and to gain impact through shifting guidelines. The visiting department chair said in the same conversation:

> They are really desperately collecting all of this big data because this will give them influence — they have a standardized specimens (biao ben) so their data is good when they publish it —Professor [X] from Fudan University says that in one year he has over one thousand laparoscopic gastrectomies - just gastrectomies! Laparoscopy in Fujian is really at the forefront.
>
> They need databases to know how well they do. But they have the capability to do this! They are able to attract people because he is at the forefront of the laparoscopic surgery standardization — a lot of the top influential surgeons were all trained personally by him! And they all follow his way of things: how you hold the instrument, what you do at each step, it is all standardized — so his data is very trustworthy.

Trustworthy data comes from large numbers, but it also comes from being created in the right environment, under the right leadership: someone who has experience, some who already has influence, resources, and a transparent approach that others can emulate. The collection of data allows an accumulation of influence, a magnification effect for when data is published (see Chapter 3 for more). In the case of the CLASS-01 trial, the results of these standardized specimens could have the impact of influencing guidelines: the ultimate, seemingly objective internationally-respected goal. Data is therefore a means to prove superiority not only in showing difference in results themselves, but in the ability of an institution (or individual) to produce data is a sign of competence and acceptance into an international scientific community.

To author the paper that changes guidelines is the ultimate sign of setting the rules on the global stage. At New China Hospital, there are research workshops that researchers attend to learn how guidelines are created and how to conduct research that will impact guidelines. Faculty members from coastal institutions who have been on international guideline-writing panels fly in to run multi-day workshops which have long waiting lists; participants include doctoral nursing students and older professors seeking to learn updated big-data analysis and statistical methodology.

Guidelines have become central to both clinical decision-making and research aims. Dr. Chao once asked me during an operation how closely American surgical oncologists or medical oncologists follow NCCN guidelines; he says to me, "We follow the guidelines very closely but we are always wondering if the people who wrote them do too." Given the idealized role of guidelines and standards in global surgeries, Chinese surgeons strive to be competitive and impact guidelines in order to be taken seriously on a global surgical field. Guidelines, and the potential to influence or write guidelines, have become one more way to garner prestige, not just for the individual researcher or physician, but for China.

During morning report, the chair of our department announced one day that a prominent international (read: White) scholar would be visiting the department to deliver a talk on recent guidelines in cancer surgery. He pressed the junior attendings and graduate students to attend, specifically noting that this was an opportunity to network with someone with significant

influence on the international stage with regards to guidelines and publications and would be able to bring attention to China: "There are a lot of resources in China — how can we let the international world know of our work? We need to let our work be known." Our department needs to be at the forefront of guidelines, he tells everyone. *For us, and for China*.

The CLASS-01 trial used a collection of databases in order to transform clinical guidelines, providing basis for an argument that in general, laparoscopic D2 gastrectomies could be used in later stage gastric cancer (or at least, that they are "non-inferior"). In addition, the CLASS-01 trial created an opportunity for collaboration amidst a group of Chinese surgeons and principal investigators, a rare example of active and productive research cooperation across institutions which they hoped that other researchers would emulate.

Building on the foundation of collaboration established through CLASS-01, subsequent trials regarding laparoscopic gastric cancer surgery had already been launched in response to additional clinical questions which arose from the original trial, making clear how data points, once born from clinical practice, could be regenerated and reused for multiple purposes, amassed with similar data to tell a more compelling story, or interpolated with a different dataset to tell a different story. The next iteration with the same multidisciplinary collaborators, the ongoing CLASS-02 trial, evaluates laparoscopic total gastrectomy for early gastric cancer and the CLASS-03 trial evaluates laparoscopic D2 gastrectomy following neo-adjuvant chemotherapy for locally advanced gastric cancer.

The CLASS-01 trial also made evident a lack of training and education regarding databases and clinical research in China, especially amongst surgeons. The successful coordination of this trial required senior Chinese surgeons to learn how to run clinical trials and establish institutional research teams, hiring research coordinators or training graduate students to meticulously collect data on each enrolled individual. For many institutions, it was their first time working with data management groups or hiring clinical research teams for the administrative work required.

In the past decade, there has been a proliferation of third-party companies (CRO, clinical research organizations) that specialize in clinical research. Academic research groups can hire their employees to organize samples or trial enrollees and to gather whatever information is needed for any given specific sample. This can include following up with patients for sample collection, data collection, and collation. I happened to be writing fieldnotes next to one of the CRO employees once, who explained her work as a CRC (clinical research collaborator):

> I just need their outpatient clinic card, I just copy that number down and then I can enter that number into the electronic medical record and see whatever diagnostic tests they get and see a copy of their colonoscopy report. Once I have that number I can look it up to find out any information I need. It is really a lot of work - every single one of these pages has to be signed by the PI. They are really strict when they investigate— there's a specific organization that is in charge of quality control of these things and they are very strict – they do a random sample, they'll give us random numbers to pull and we pull whichever files they ask for. … And afterwards all of these records are kept here for five years, we don't keep them in the ward though we keep them in the research organization department in the No 5 hospital, they have to stamp everything there and finalize all of the records. All of the payments then get sorted and then I don't have

> anything to do. I used to study nursing. People in our line of work have to be either studied medicine, pharmacy, or nursing. It is still tiring, but at least we don't have to take call, we are in charge of our own time, and there's no one in charge of us.

Any given trial can be several hundred patients, enrolled across various different hospitals, although if in different regions, generally different CRCs will be hired (they work remotely from their parent company in Beijing). She told me that there has been a significant increase in clinical research in China, and that New China Hospital was still very much in its nascent stages compared to hospitals in Beijing, Shanghai, and Guangzhou.

Prior to CLASS-01, many centers had no prior experience but are now capable of multi-center coordination, quality control, database development, and efficient follow-up. Dr. Chao, who was one of the authors who helped set up the CLASS-01 trial, told me that through the process of establishing, running, and publishing this trial, Chinese surgeons strengthened international surgical and research collaboration through active communication with international colleagues in Japanese and Korea to improve study design and implementation, and highlighted, for him, and for other surgical colleagues, the importance of such collaboration and dialogue.

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The game of numbers is one every surgeon now needs to play: surgeries and surgeons are reduced to or expanded into multiple numbers and data points (mortality rates, number of lymph nodes, post-operative complication rates, number of total operations, number of publications, etc. etc.). The surgical volume described in Chapter 1 proliferates further: surgical practice given pluripotency through the birth and lifecycle of numbers. And though Chinese surgeons feel pressured to standardize, standardization still leaves much room for the stubbornly persistent centrality of individual surgeons and the ongoing apprentice-model rather than horizontal-model of training.

Rather than establishing guidelines in order to create standardization of practice, Chinese surgeons seek to establish guidelines in order to prove superiority. Amassing the data in such a way that it can be published and accepted as guideline-shifting proves that China (and specific institutions and individuals) have the infrastructure and ability to conduct multi-institutional, collaborative, and data-driven research. Just as there is no attempt to reach sameness before establishing difference, there seems to be no attempt to standardize before attempting to change the standard: by changing the guidelines, the implication is that former guidelines have already been surpassed.

## CHAPTER THREE: TIES THAT BIND

On a giant screen in the largest conference hall on West China Medical School Campus, the animated face of an older White gentleman appeared before a packed room on an October weekend. In the background of the video, the name of a journal was engraved in the frosted glass wall behind the speaker. The man in the video is the editor-in-chief of this journal, one of the two most well-regarded medical journals both by impact-factor and reputation. The gathering in this conference room was for an annual conference in China co-hosted by this journal and the Chinese Academy of Medical Science (CAMS). For years it had been hosted in Beijing, and for the first time, it was being hosted in Valley City, at West China Medical School.

The man in the video, Dr. Howell, is the editor-in-chief of the journal. Through a pre-recorded video, he welcomed everyone to the conference, expressing his regrets that he could not be present in person, and lauded the advancement of Chinese physicians and scientists over the past few years. While beaming at the camera, he praised the "stunning unprecedented progress" and proclaimed that "*there is no country in the world that can boast the progress that China can, the success that we've seen in the past ten years bodes very well for the future*." He expressed his gratitude that so many Chinese researchers choose to share their research via his journal and with exaggerated expression extended across the enormous screen, welcomed continued collaboration between this journal and Chinese scholars. The video faded out to black, and the Asia Editor of the journal, a middle-aged Chinese woman, took the stage to deliver her own welcome.

There was applause throughout the room, and everyone had sat up attentively. Most of the scholars in the room had never published in this journal and were attending the conference hoping that one day they would have the chance to. Dr. Howell was not insincere in his gratitude – he is well beloved by Chinese scholars for his support of Chinese science and research and his attention towards China with an annual China-focused issue which launches at the same time as the CAMS conference. However, the likelihood of publishing in this journal, for most scholars here, will be slim; regardless, it is a dream, and this is a generation of dreamers – in themselves, in their country, in the power of a single publication, like Cinderella's glass slipper, to change their life.

This chapter examines the challenges of and incentives for Chinese physicians and scientists to produce research publications. Publication of academic papers, especially in English-language international journals, allows for the transformation of data into mutable and mobile knowledge. In China, hope for publications represents hope for the mobilization of knowledge, the mobilization of people, and the mobilization of the country.

This chapter also introduces the tensions between an increasingly interconnected global community and a trend of increasing localization, decoupling between global powers, a sense that there is a need to build self-reliance and in service of this, a desire to regulate flows of people, information, and practices. As the U.S.-China trade wars escalated, "*We don't need [the West]*" became an increasingly common refrain, whether with regard to post-graduate training, surgical instruments, monoclonal antibodies and pharmaceuticals, or hospital systems and management. However, this phrase is never said about English-language journals (based in "the West" and run by English or American editors). Despite other calls to decouple, Chinese academic institutions and scholars continue to rely on research publications and English-language journals for affirmation and standardization.

This ethnographic exploration of research and publication practices at this academic tertiary hospital reveals questions about China's ties that bind: the cruel entanglement of reliance as China strives to prove intellectual and national distinction. Why is China so preoccupied with research metrics (number of publications, number of publications in high impact journals, etc.) as a form of demonstrating strength? What do publications come to represent for this academic institution and for individual scholars?

**Research as Comparison**

Medical research, at its core, is a comparative process. Randomized control trials, the gold-standard of medical and clinical research, compares one intervention against another, blinding both the patient and the provider to which intervention is being provided. The sample from one patient is compared to the sample of another. The sample of ten patients from one institution are compared to the samples of ten patients from another institution. The research integrity of one institution is judged by the purity of those samples; conversely, the reliability of those samples depends on the reputation of that hospital.

Publications are the outcome of these comparisons, one layer of comparison after another. One of the senior attendings, in a public lecture to a number of local surgeons, lectures them: "How do you know you're a good doctor? You think you are saving lives, but are you following these patients to see what happens to them? Are you comparing your results with someone else's? Are you looking at what other countries are capable of? Other institutions?" As discussed in previous chapters, if you do not collect data, you cannot compare, and you cannot compare, you cannot prove distinction.

An interview with another interlocutor shifts the node of comparison from research itself to publications, stating that it is in a published manuscript where the final comparisons take form and which allow these comparisons to travel and have impact:

> How do we evaluate whether something is real? … If you do a million cases or surgeries, there's no point. You have to be able to say, **I've done** one million cases and I've published them in [a high impact journal]. I've done this data collection, this comparison. And now I am showing you that I have done things that can change clinical practice.

Though "a million surgeries" is surely an exaggeration, the point is that large quantities and big numbers on their own do not matter: they only matter if large numbers are compared with other numbers and published in a high impact journal where that comparison can be seen and scrutinized, and where the scrutiny can lead to (possible) change in practice. The focus on the individual (*I've done…cases, I've published them…I've done this data collection, I am showing you…*) also indicates the way research is a point of pride for institutions: there is a sense of ego that dominates this endeavor.

There is no point doing something if what you have done is not done *rigorously*, in a way that can be examined by others and believed by others to be true. Doing a million operations is not enough: those operations must be counted, catalogued, compared to other operations, and conclusions have to be drawn which will impact how other people choose to approach that operation. Publications take what is done in an operating room (or in several operating rooms, across various hospitals and throughout various provinces) out of the operating room and into

other spaces, connecting one sample to another sample, one hospital or one researcher with the rest of the world.

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When I was not in the operating room, I started using the office space of one of my interlocutors. Four associate professors shared one office, four desks shoved up against each other or against the walls, a metal-frame bunk-bed for taking naps while on call, a very small window through which you could see the perpetually grey skies in Valley City. The most senior surgeon occupied the desk by the window — if his desk placement did not already indicate rank, his Keurig coffee machine and boxes of cigarettes marked his status. He often sat at his desk and quietly smoked — three of the four professors in the office smoked, and though they made an effort to open the window and door to air out the room between cigarettes, the scent had long ago seeped into the walls and furniture.

I sat at the second or third desk; whichever surgeon was operating and absent, I would borrow their space. Occasionally patients would come by seeking a physician, having managed to sneak past the guards who kept patients and their families from entering the hallway of administrative offices and conference rooms. But most of the people who came by were students, a relatively steady stream on any non-operative day.

I was working at Dr. Wu's desk one day when one of Dr. Yang's students walked in to meet with him, to go through a draft of a manuscript on the student's laptop, line by line, word by word. Dr. Yang read through the first pages, making comments as he went — "much better, I'm glad you changed that." Or, "remember, never start a sentence with 'because.'" A few minutes later, "where is this sentence from? It doesn't make sense here." The student looks sheepish and said, "I took it from another article."

Dr. Yang continued: "You have to add a 'therefore' here, to create a connection between these two sentences, you have to split these into two sentences so that someone can follow what you're saying. What are you saying here? You need to explicitly state what you did to get this data."

I looked up and caught Dr. Yang's eye – he had been so welcoming to me since I had arrived, always taking time to explain certain surgical approaches or techniques. He appreciated that I took notes on lectures and drew sketches of vessels or lymph node stations in my notebooks to remember relevant surgical anatomy. Before I really thought about what I was doing, I blurted out: *I can take a look if that would be helpful*.

Dr. Yang demurred – "I don't want to waste your time." And then a few seconds later, what I knew was sure to come: "But if you could, my student could learn so much from you."

I told him it was no problem and pulled up a chair next to the two of them to look through the manuscript again.

I think every anthropologist finds that in order to stay and continue to be welcome at a field site, one must provide a service. Sometimes it is to be a collector of stories, a drinking buddy, a documentation of grievances. For me, it was, at first, to be an extra arm in the operating room, an extra body to step in when short-staffed on busy operative days. But I always knew, though I hesitated in the beginning to admit it, that my value would be language, and specifically, whatever help I could provide with research manuscripts. In this hospital, there was

no greater currency than publications, and if I could help get a publication, I would more than earn my right to observe, write, or hear their stories.

Research was not my strong suit – or at least, not research of this form. Though I had formerly been a lab scientist, working for many years in immunology labs, neither lab I had been in were so-called "paper mills" and though I published, I certainly was not the kind of researcher who knew and understood the clockwork machinations of taking a publication from question to data collection to analysis to manuscript through peer review. I had never done clinical research and was not well versed in this clinical topic. I was nervous to offer my help, both in wanting to protect my time and in doubting my ability to help a paper (or the authors of that paper) — what if after all of my help, these manuscripts still were not accepted? Would these professors think it was my fault or that my helping was not worth it? I reasoned it was better not to offer and avoid such possible failure.

Yet I remembered my own first time writing a scientific paper. I was seventeen, having spent the summer working in an immunology lab under a graduate student who was nearing graduation and had enough to do that I was an unwelcome burden. The research program had encouraged all of us high school students to write up our summer research and to submit it to various science competitions. Though I had always enjoyed science, my high school was not known for its STEM education, and I did not know where to begin. I remembered searching PubMed and reading similar papers – not to understand their content, which was far beyond my knowledge – but just to absorb their syntax, the ways certain words were used to mean certain things, an ordering of verbs and nouns, clauses and phrases. I remembered going to figure legends and methods sections to find out how others had described the generation of point mutations, what information needed to be included when chronicling flow cytometry experiments or western blots. I could not imagine doing so without English language fluency: scientific language was another language in itself.

I knew also that my presence in this department had been smooth largely due to a single second-authored paper in the aforementioned prominent, international journal. It was a correspondence rather than a research article, and I was neither corresponding nor first author, but it was enough. My name on that article was a promise that I had inside knowledge on how it could be done (I did not); that perhaps I had something to offer. As many of my colleagues and fellow-trainees later told me, a single paper in a top journal could graduate multiple students. Even the possibility of a similarly ranked publication was enough to keep me around.

The importance of publications is not unique to China. The phrase "publish or perish" is one uttered often by my PhD colleagues in America, who face the same pressures as they consider academic careers and trajectories. Medical doctors who choose to leave academic medicine often cite that mentality as their reasoning – the constant pressure to produce publications was no longer of interest to them. Though there is an emphasis on publication throughout the academy, the emphasis on publications within the Chinese academy is particularly political. The following sections explore the challenges of publishing papers amidst the "transnational scientific commons" as a Chinese researcher, as well as the incentives for publication for Chinese scholars. In doing so, I examine publications as a comparative practice, and second, the comparison between Chinese scholars who hope to publish in these prominent medical journals and those who manage to.

On Wednesday evenings, after multi-disciplinary tumor board, where medical oncologists and radiation oncologists gather to discuss difficult cases with the surgeons, the faculty gather their papers and water bottles as students slowly trickle in, filling in the seats in the back of the large conference room where morning report is held.

Takeout boxes are delivered for dinner — slabs of white rice with one or two salty, saucy stir-fries on top. Fruit and snacks, leftover from tumor board, get passed backwards. I take the tangerine passed to me as a peace offering: a welcome acknowledgement, though I don't recognize the student who hands me the fruit. One of the students — I cannot keep track of which ones are Masters students and which ones are doctoral students and which ones are visiting students hoping to become doctoral students — hands me a takeout box — *eat*, he tells me, *there's enough.*

Wednesday evenings are when Professor Wang has his research meetings. His students (in total there are over twenty at different stages of training) take turns presenting their work. He doles out suggestions, never truly criticisms, and sometimes chastises students for moving too slowly or not being collaborative enough. These meetings are the skeletal backbone for one of the more productive research groups at New China Hospital. Many students seek to be accepted by Dr. Wang because he is renowned as a technical expert in laparoscopically treating rectal cancer and because he is a prolific and well-respected researcher.

Once I began to offer my services as a copy-editor or manuscript-editor, I stopped being ignored by the trainees. I took on one manuscript at a time, not wanting to over-promise and under-deliver. Though it would only take several hours to do a superficial edit of grammar and syntax, I soon found that most manuscripts needed more than tweaking of awkward phrases and subject-verb disagreements.

The quality of manuscripts was widely discrepant – all could benefit from minor edits, but most required much more. The lack of standardization of training, as discussed in Chapter One, resulted in grossly different levels of English language ability, but perhaps more importantly, in different understandings of the structure and framework of scientific papers. What was the question? What had been written already about this question? What data was available to answer that question? Was that data reliable?

If they had already chosen a target journal, I read that journal's articles to see the framing, analysis, and data quality of published articles in that journal. This process often took many days (the slow speed of the internet and getting past a firewall in order to quickly access relevant articles being the limiting factor); I was eventually chastised by my mentors to spend less time on these manuscripts ("if you put 150% effort into these things people are just going to ask you to do more! Just spend a few hours editing the language, not doing a total overhaul! You have your own writing to do!").

I later found out that there were multiple companies (Scribendi, Papertrue, amongst others) which offered academic paper editing services for journal articles, masters and PhD theses, personal statements and other application essays. A five-thousand-word manuscript (fairly typical for a scientific or medical journal) would cost 1256 RMB (approximately 180 USD) to be edited, with a 48-hour turn-around time. Of course, a faster 24-hour turn-around would be an additional premium. When I asked my friends about these services, they told me that the quality was not great – you could expect that the editing service would proofread for basic spelling and grammar, but not much more. As one of the associate professors told me,

"what do you expect? They are not experts in science, they do not have medical backgrounds, they are just doing a cursory job." I later realized that many of the manuscripts which landed in my inbox had already gone through these services; many of them still contained grammar and syntax errors, and few of them made "sense."

The students I spoke to and worked with on their manuscripts often commented that they were at a disadvantage being at New China Hospital, that the universities and hospitals on the coast had many more resources. Even the department chair commented occasionally on the difference in research quality, saying at one morning report, "I really hope we can develop some professionally relevant research topics: what they're doing in Beijing, Shanghai, Nanjing – what they're doing we're doing here too. But we need to be able to do research to prove it. We need systematic research and standardization." The chair was commenting on the lack of research collaboration between the nurses (many of whom also had to publish research in order to graduate or stay at New China Hospitals) and the physician researchers. Often, research data collection and patient consents relied on the assistance of nursing staff, and the chair of the department lamented that there were not more concrete research structures in place to foster this collaboration and faster, more standardized data collection.

The students were lamenting a lack of resources: a sense that at other places there was more access to databases, more established research management groups, more research funds for conferences and editing services and reagents, more paid research coordinators who would help consent patients and manage databases. What they also lacked was systematic training – whether or not they learned how to do research depended on whether or not their mentors knew how to do research. A good mentor would guide them on how to work with data, how to learn statistics (or with whom to collaborate), how to apply for IRB approval, how to write a paper, how to write a cover letter, how to get a job. There were no foundational courses in the masters or PhD programs, and students did whatever research projects their faculty sponsor wanted them to do. Students recognized that they were being compared based solely on their publications, and the quality of their publications depended solely on their research mentors.

### *It's all about those three numbers*

In the most prominent wall-space across from the nurse's station, one can find the bios of all of administrative leaders and professors of the department. In each of their bios, they have listed their publication success; often something along the lines of "Professor so-and-so has over [some number] of first author or corresponding author publications and has published in journals such as X, Y, and Z." Professor Wang is the Vice Chair of the Department, and his publication record and clinical success are at least a part of the story. His weekly research meetings were organized and he encouraged younger students to join older students to learn the ropes. Even still, collaboration felt forced and each student prioritized their own project more than the projects of the collective research group.

Throughout China, publications are a requirement for graduating from graduate programs, though depending on the standing of the university, the guidelines for what publications count may differ. I often saw an excel spreadsheet circulated of which journals were in which tiers – when a manuscript was finished, most students picked a journal at random, finding the highest impact factor within a certain tier and working their way down after inevitable rejections.

There were no internal guidelines for graduate student graduation: once admitted, there were no standardized courses, no qualifying examinations, and the dissertation defense was a mere formality. For Masters students, one publication in any international (English-language) journal was sufficient for graduation. For PhD students, the standards could be higher. Regardless, the evaluation of a student was not by their advisor or professors at their own university, but by peer review and an editorial board. What is being evaluated, it seemed, is the willingness of an individual to commit to a subject, to do the necessary experiments, to write up an English-language manuscript in order for it to be accepted and published by a journal.

Early on in my fieldwork, I sat in on the dissertation defenses of the Masters students who were graduating from the department. There were few questions after each presentation, and though each student was nervous, they also knew that this was mere formality. One of fellows who sat next to me during the PhD dissertation defenses asked me what I thought of the presentations afterwards. He told me that he had heard that in America, students have to come up with their own project and were expected to do the research independently – *how difficult is that*, he asked me? I told him that at least amongst my colleagues, students often have guidance from their professors, but that the platonic ideal of the academic system was to develop one's ability to contribute to a larger body of knowledge in a conceptually creative or forward-thinking way, to somehow forward what is possible for others in the field. He shook his head wryly and told me that "it is not at all like that here."

Despite the fact that in America it is just as crucial to publish, the publication is seen as a result of one's contribution to the body of knowledge. Are we just fooling ourselves to think we are not the same? In my first weeks as part of Professor He's surgical team, he asked me what the requirements for PhD graduation were at Stanford – I tell him that most of my classmates, who are pursuing PhDs in sciences rather than anthropology, are expected to publish an article in a major journal – Nature, Science, Cell – if they conducted clinical research, perhaps New England Journal of Medicine or Lancet. *That's a high bar*, he told me. Dr. Chao, who was always on my side, noted "she's already done it" with a smile. "My article is a correspondence and not a research article though," I said, always trying to make that point clear.

It seems strange to be writing about how hyper-focused Chinese scholars are on publication records, when American academia (academic jobs, residency programs) judges the same thing. But perhaps Chinese academic circles are more governed by Goodhart's law: the idea that a measure (in this case, publication records) ceases to be functional as a measure when the measure itself becomes the target (Strathern 1997). The focus is shifted so heavily towards publication rather than the path towards it that only the end result matters. Good research is defined as *publishable* research, and Chinese scholars are anxious to publish within a short time frame – within the next few months, within the next year. The focus is not on the research process but when the end result can be produced. Because academic careers are so competitive (it does always seem to come down to an argument about the size of China's population and limited resources and a subsequent Malthusian logic), institutions and individuals rely on a few numbers or measures to differentiate applicants, and each publication really affects the lives of these scholars.

In a webinar on how to publish in high-impact journals, the presenter poses a hypothetical question: *Why do we do research?* Without waiting, she then answers the question herself: "You might think this is a stupid question and it is because you need it for professional growth, but at the core of it is sharing your new idea with the world – it has to be new,

innovative research – it is for the research, for your institution, for yourself" (emphasis mine). The webinar presenter recognizes that for most researchers, the goal is merely professional growth, and offers an alternative, that the goal is to be innovative, to share a new idea. The publication is the measure, a byproduct of this, rather than the target itself.

Perhaps I think that in America there is a more holistic review, a sense that someone's accomplishments are more than their *curriculum vitae* and a quick arithmetic of their publications. That a candidate is more than just the sum of three numbers as it seems to be here: (1) how many publications, (2) what number author you were, and (3) the impact factor of the journal being the three most crucial numbers by which any graduate student or faculty up for tenure is being judged.

Towards the end of my research time, I sit in on an internal meeting with the senior faculty, as newly graduated MD/PhD students interview with the faculty for positions at the hospital. Though the graduates introduce themselves and their research, all attention is focused on a single slide: a table of their publications with a few columns: what number author (first author, second author, etc.), the journal, and what the impact factor of the journal is. At a single glance, the department chair can make quick calculus of an individual's research productivity, and by extension, their research potential. Seven articles, four first author, impact factors above ten. *We'll take him.*

The pressure on graduate students arises from a larger academic logic that everyone has the opportunity to rise if only one publishes enough papers. The high-impact factor paper is the fairy dust that can transform any hardworking or lucky individual. It sounds hyperbolic, but a high-impact paper will guarantee graduation or promotion, whichever is next. I am told the story of a community doctor who has an abstract accepted at the CAMS conference and tells media articles that her research has been published in this high-impact-factor journal. The media picks it up and she is soon a local hero, and patients flock to her family medicine practice.

One senior attending at a community hospital said to me "looking at it from an optimistic perspective, this actually makes it more equitable. There aren't really tiers or classes in Chinese society right now. If I publish, I can get out of here." I disagree wholeheartedly with his premise – there are certainly classes and tiers in China, and these tiers define whether someone has access to resources and protected time which are necessary to conduct research. But I recognized his perspective: a durable hope that one could publish and climb, eventually climbing through a department, out of the department, and out of the local community to a big city.

Often research grants also come with stipulations – if a researcher receives a grant from the department or the government, there are requirements for what the deliverables are (and usually the deliverables are publications). When asking me about my research funding, one senior scholar expressed shock at the possibility of not delivering despite being on a grant: "Do they have a more absolute standard for what they expect if you receive the grant? Like the dissertation has to be at what level or has to be published in a journal with an impact factor above some number? Like how many papers you are doing?" When I told him that for anthropology, these deliverables are not as relevant, and that we are not necessarily expected to publish papers while still graduate students, he is shocked and confused. He then continued to describe his own experience with research grants:

> We are much stricter about our expectations for deliverables, like the dissertation must receive a score above a certain number and the paper has to have an impact

> factor above 4, like you have to have a certain number with an impact factor above 4 and a certain number with an impact factor above 5 which then pushes everyone to constantly be submitting good papers. But sometimes it is just for the sake of publishing papers that you keep pushing to publish papers.

He told me that if he got a national or institutional grant and did not deliver the expected publications within a certain time frame, he would be ruining his chances of ever getting a grant again (and probably his chances of rising academically).

As if the personal need to strive and the individual professional incentives were not significant enough, there are additional departmental financial incentives as well. At most large research institutions (New China Hospital included) the department or university awards first and corresponding authors 10,000 RMB per impact factor as a bonus for successful research projects. If there is one first author and one corresponding author (senior author), they each get 5,000 RMB. If you publish somewhere with an impact of 5, the total sum multiplies to 50,000 RMB: 25,000 RMB for the first author (or 12,500 for each of two co-first-authors) and 25,000 RMB for the corresponding author.

This is not the only complex arithmetic around publications. Each graduate needs to publish a certain number of publications within a certain timeframe to make associate professor, and then another number to make tenure professor. Again, these publications only count if one is first or senior author, and co-first author papers count as half a paper. If there are three co-authors, the publication counts as one-third of a publication. Even if someone's CV shows an impressive list of first-author publications, they still may not make tenure, because triple the number are required due to the number of co-first authors. As only first and senior authors count for these incentives, there are increasingly large number of people sharing co-author status (the most I saw was four) and in the past several years, several US-based medical and scientific journals have banned co-first authors, whether or not in response to these shenanigans, it would be difficult to say. The result of these calculations is that only first and senior authors matter – no one cares about being second author or third author or fourth author and thus large-scale collaborations are rare.

These incentives also create difficult relationships between students and their mentors. At one morning report, one of the vice-chairs notes a news story about professors getting in trouble because it was found that their students falsify data. The next afternoon, in the shared office, Dr. Yang sternly tells his student: "You have to make sure your data is real, absolutely do not make up data. It is okay if you submit it to a bit lower impact factor journal, the impact of making up data is too significant." The fear strikes everyone – students can be a cause for pride but also an enormous liability. He turns to me and explains, as he sees that I am listening: "all over the country professors are facing this issue — mentors don't care about an extra paper but graduate students, in order to graduate need these papers, everyone thinks a higher impact factor is better, but just try your best, it's hard, it's a lot of work, doing all of this." What he means is, please do not ruin me just so you can graduate.

### *What are we missing?*

In my curiosity about Chinese scholars and the pressure and challenges surrounding publishing, I schedule an interview with Diane, the Asia Editor of the aforementioned prominent international journal. We had first met at the CAMS conference in Valley City; after the first

day's talks, I approached her and mentioned that I was curious about the push for Chinese scholars to publish medical research and the role that she played in highlighting and encouraging research progress in China over the past ten years. She seemed excited to share her story and to discuss her observations over her many years at her position, and told me to keep in contact with her, though she was very busy.

I got in touch with her while visiting Beijing, and she made time to meet me, joining me in the hipster coffee shop in an expat area of the city. She joined me a bit late, having fought traffic to arrive after speaking with students in the lab of Youyou Tu, who was awarded the Nobel Prize in medicine for the discovery of the artemisinin and illuminating the role of traditional medicine in the modern world. As we sat down to chat, she asked me about my project, and my collaboration with various New China Hospital scholars, in reference to the work I had presented at the conference where we had met.

I mentioned that it had been interesting working with Chinese scholars and that I felt that I had something to offer when it came to their written manuscripts, that I had found a difference in the writing of research manuscripts that extended beyond syntax and grammar. She nodded in agreement. She has read thousands of manuscripts which come to her from scholars across China; she has commissioned many articles, inviting scholars to contribute and working with them on their manuscripts. For over a decade she has been in this role, and while I had only seen a few articles, and all from one institution, she sees them all.

She told me that she agrees with my assessment: that there is something fundamentally different (*missing*, is what she says) and that she often feels that she does not know how to guide or help Chinese scholars to get there:

> You're absolutely right. It's not just about the language, it's the thinking style. Let me give you an example, for the Wagley prize, I had them submit the essays in Chinese, and then that's how I realized, that ultimately their Chinese writing is not very good either. This isn't a language issue: it is that there isn't clarity of thought. There isn't a clear hypothesis and there isn't training. They are publishing for publishing's sake – there is no vision.

In our conversation, she seemed to blame the difference in quality of written manuscript on the lack of training and the lack of hypothesis. She often says in her webinars and presentations that in China, researchers are not provided enough training to learn how to develop a strong narrative. But what interests me is the question at the center of her response: what does she mean by "thinking style"? What do we define as "clarity of thought"?

In her many years of experience, Diane has collated a list of style mistakes – seemingly small differences that often result in the rejection of papers. They read almost as a list of pet-peeves, but having read a number of Chinese manuscripts, I find myself nodding my head. "Often you use longer sentences thinking that more complex sentence is better, but we want concise, logical language." "Use signposts and headlines to help guide your reader." "Use the correct formatting. I can tell just by looking at the formatting that this is not for my journal." "We like active voice because passive voice is refusing responsibility." These are all components of taking the "ingredients" of research and putting together a "delicious meal."

She tells participants to take the perspective of the reader: what are your main points? What abbreviations or phrases would they know? For example, Chinese physicians and scientists often refer to "Tier III hospitals" and Diane tells them: "Reviewers who are not from China are

not going to know what that means." I take this example personally – it took me months to figure out what Tier III hospitals were, and the differences between Tier IIIA and Tier IIIB hospitals (all in service of understanding medical alliances, discussed in the next chapter). Yet I also question: how are researchers supposed to know what is normal and what is not if they do not have a frame of reference? How are they supposed to know what someone else *does not* know, especially if these are phrases or frames of reference which are so common and embedded in their daily life and practice? Should their reviewers be Chinese scholars who share the same sense of normal? Why is it an expectation for Chinese scholars to know the conventions of the National Health Services (NHS) in the United Kingdom, despite having never been there?

In one of her webinar presentations that she gives on tactics to public papers in high-impact journals, she tells the participants to ask themselves: Why is this innovative? ("A lot of Chinese papers are rejected because there is no novelty in their research" she says.) What challenges are you addressing and how did you solve them? I wonder about the specificity of "novelty" – there are ideas and approaches which are certainly novel, but would not be considered innovative (or productive): what she is calling for cannot be captured by the need to be different for the sake of being different.

Yet novelty for the sake of novelty is not enough. I think of Chinese biophysicist He Jiankui's CRISPR babies: the CRISPR gene-edited human embryos to disable the CCR5 gene to protect the babies from HIV infection. The experiment was novel, innovative, a daring application of a scientific technique which went beyond what anyone else had previously done. And yet, he was immediately fired by his university, fined 3 million RMB, banned from applying for further research funding, and sentenced to three years in prison for illegal medical practices.

He's experiment was seen as an embarrassment for China, and whenever brought up, most researchers I spoke to quickly changed the topic. Many felt that China already had a reputation of being an unethical "wild West" for biomedical research: a reputation many individual scientists felt had slowed their own research. He's research project was found to be unethical on many accounts: lacking Institutional Review Board (IRB) approval, forging informed consent, pressuring the parents to participate, and defrauding the Chinese regulatory process by having HIV negative men pose as the intended fathers (Osborne 2019; Regalado 2019).

Though the project was praised on the first day as a great national achievement and He was lauded as a hero by state media, newspaper articles from that first day (and any evidence of those articles) were soon washed from the internet. He and his project were condemned by many bioethicists, leading genetic researchers and biochemists, the United States NIH, the Chinese Academy of Medical Sciences, and many others; efforts to publish He's manuscript in leading medical and scientific journals were all denied, with reviewers citing ethical concerns (Regalado, Antonio 2019).

The media attention in the aftermath of He's announcement and arrest scrutinized not only He Jiankui and his Chinese collaborators, but the American scientists and researchers with whom he had spoken and corresponded regarding his work. Like many pre-eminent Chinese research scholars, He had done extensive graduate studies in the United States, receiving his PhD from Rice University in Michael Deem's lab, and then completing a post-doctorate fellowship at Stanford University, where he learned the CRISPR/Cas9 gene-editing technique in the Quake Lab. Deem was included on the original unpublished manuscript and was purportedly present during the informed consent of the research participants. Many researchers questioned whether

these American researchers with whom He had consulted and discussed his project, including an ethicist at Stanford University, should have intervened. All researchers who granted press interviews insisted that though they disagreed with He's project, they did nothing to stop him.

He's CRISPR babies and his career downfall highlight the standards of scientific practice against which scientific research is held. He is criticized for registering his experiment in the clinical trial database after the research had been conducted, just prior to submitting the manuscript for review. Since 2005, the International Committee of Medical Journal Editors required that all trials be registered before publication; many of the researchers with whom I worked noted that these regulations were not well known or well established in China, despite their fifteen-year history.

He was aware of having to navigate the ethical norms and standards of the (largely American) scientific journal publishers. His correspondences with a bioethicists at Stanford University show his concern over "PR and ethics" (Belluck 2019). He was warned that his project would be heavily scrutinized, both from a research perspective and an ethical perspective: in modern scientific practices, the two are inseparable. Research that is not conducted according to ethical norms cannot be published, and cannot be added to the academic "body of knowledge" – unethical science is not science.

While the entirety of He's CRISPR baby debacle occurred before my arrival in China, its aftermath continued to ripple through the medical and scientific community as I conducted research in the academic setting. It was, perhaps, also just one example of an ongoing sense of frustration regarding the intersection of Chinese scientific progress and international scientific norms. Some expressed frustration that certain Chinese scholars were still "behind" and were still unaware of how to "do science" in the "right" way, such that research would be accepted: controls, ethics review, pre-registered trials, peer review. One junior researcher said to me, "in order to sit with the big kids at the big-kid table, we have to do things right first." It is unclear to me whether this sense of "rightness" indicates an alignment with others' (Western?) norms or whether there is a sense that this method is truly right: perhaps more importantly, it does not seem to matter. Pragmatically, to accomplish what a researcher in China wants to accomplish, one must act and conduct research in certain ways.

Others expressed frustration at the bureaucratic hoops to jump through which were seemingly meaningless. Whether registering for trials or receiving ethics review board approval is seen as a checkbox to be checked, which frustratingly, many research teams forget or do not even know exist. For those who complete ethics reviews, they are mere administrative formalities: for my own research collaborations, I was told that it was without question, and that we should "go ahead and start while waiting; it'll come through."

Institutional Review Boards (or IRBs) were established with the intention to protect human subjects, yet they have been criticized for emphasizing minutiae, obstructing research, and protecting the research institution from liability rather than the research subjects within a research study (Whitney et al. 2008). Informed consent, a tenet of the IRB process and of research studies and medical treatment, has also been critiqued for an assumption of the cultural norm of individual autonomy.

In my conversation with Diane, she mentions multiple reasons why she thinks Chinese scholars often do not succeed in their attempts to publish in higher-impact journals. Though her list is thorough, she barely touches on the quality or integrity of the research itself. Rather, her

qualms are with Chinese scholars' non-compliance to what she describes as these "procedures" or norms (some directly regulated some implicit) in the international community. Yet to refer to this as non-compliance implies that this behavior is intentional, a flagrant defiance of academic principles known to all.

She tells me a list of their mistakes, which are committed time and time again without consideration or improvement. They do not get IRB approval before working with human subjects (or they do so after experiments have begun); they do not register their clinical trials (or they register them retroactively); they do not fill out conflict of interest forms ("if you do pharmaceutical trials, can you possibly have no conflicts of interest? If you are on the advisory board of a pharmaceutical company, do you not think this is a conflict of interest?" she poses to me rhetorically); they change their protocols haphazardly because the protocols are not representative of what is actually done in their research.

She tells me about how she recently rejected a paper because after she asked the lead author a few questions about the protocol, the author emailed her back saying they had changed the protocol to address her questions. "I told them – If they can change the protocol so easily, just revising the protocol like this… I can't trust your protocol anymore. And of course, they appealed later and said we just wanted to answer your questions too much and we were too eager to please you."

Unlike the style mistakes discussed above which can be corrected through careful editing or an awareness of country-specific jargon, these missteps are seen as shameless ignorance of the sanctity of research norms which are revealed through the publication process. Diane has sympathy for these researchers, at least at first. She recognized that many of them don't know the rules (again, she focuses on the lack of standardization of education, that these researchers were never guided by mentors who would model these norms). However, their repeated errors frustrated her. I wonder whether these researchers know the impact of their actions – all they know is that their paper is being continuously rejected, so they send the same paper, with few edits if any, to a lower tier journal. The aim is always to get the paper published. And even if these researchers wished to find out why their paper had been rejected, most have no channel through which they can receive this feedback.

In my interaction with junior scholars (and students especially), they did *not* know what procedures were expected or how to play by the rules or where to find out where the unwritten rules could be found. Many of the more senior attendings shook their head when I brought up clinical trial registration, expressing exasperation about clinical trial registry – how challenging it is to navigate (even with a Chinese Clinical Trial Registry which at least partially removes the language barrier), how hard it is to get researchers to register clinical trials in advance rather than doing so retrospectively. One of them told me: "It's incredible how often I still have to tell people that if you do not have your clinical trial registered you cannot get published."

Even if there was an awareness of requirements for publication, tasks like IRB approval or informed consent were tasks which required paper trails to follow the letter but perhaps not the intent of the requirements. In one of the ICUs, the coordinator for organ transplantation told me that "we're starting to be held to the same international standards, but it is complicated and very different of course – people have different understandings here and we have to take care of things differently." Early in my fieldwork, I sat with him as he went over paper with the father of

a brain-dead patient who had been transported to this hospital in order to be an organ donor for other patients.[34]

The father of the brain-dead patient in the ICU that day had trouble reading the papers and lacked the literacy to sign the forms – he asked the coordinator if he could thumb-print them instead. The coordinator read all of the forms out loud, or at least their titles: "this one is a consent for transfusing blood in the event that she requires a blood transfusion. There are so many forms. Here, sign here, there's still a lot to go." At certain points, he seemed more like a car salesman than a medical professional, trying to see how many add-ons he could get in one day.

Informed consent forms are generally signed my family members in China: the norm is that the patient, even if not brain-dead, is not in charge of making decisions regarding their own medical treatment. Over the course of a year, I witnessed many informed consent conversations, varying in length and varying in depth of information and bias. I heard department chairs stating at all-staff meetings "if you did your job that informed consent form would be signed" (implying that a surgeon should be able to convince a patient to do a surgery) and I heard junior surgeons patiently sitting through long conversations answering questions about potential risks of operative and non-operative treatments with distressed family members. At the end of the day, pragmatics seem to always rule: if a form needed to be signed, whatever it took for the form to be signed was acceptable.

The informed consent is one form of many necessary forms filled out by patients and physicians, and one of many necessary steps before medical care (or medical research) can proceed. Prior to any surgery, the chief resident or attending, while waiting for everything to be set up, would often flip through the patient chart, signing off the bottom of each page, and checking that the patient's family had signed where necessary. During morning report every day, the senior attendings would sit in the first two rows with stacks of patient charts, going through and signing off on updated patient notes. It was often a point of contention when forms went unsigned or when mistakes were found during this cursory signatory process.

The presence of a signature is a green light, with no regard as to how that signature was obtained. I thought often of all the researchers who receive "approval" from their "medical ethics committee" at their hospital or university take the approval as permission to proceed. The Shenzhen Hospital whose medical committee approved He's CRISPR baby research denied that approval was ever granted. In a he-said-she-said without judge or jury, the public will never know, nor is it, I believe, that relevant. Given the variations on informed consent I have witnessed, I can imagine He and his researchers performing the motions of obtaining informed consent from the parties involved.

It does not shock me that He was accused of unethical scientific practices. This is not a reflection of the scientists and physicians with whom I worked, but a reflection on the culture of technonationalism that I observed and the wide range of ethical practices that I witnessed. He

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[34] This practice was fairly common in China, with physicians notifying a national network when they had a patient who was brain-dead but otherwise relatively healthy. The patient (still considered a live patient) would be transferred to a hospital with the capacity for transplant surgery, with the reasoning that at larger academic hospitals, expert physicians could run additional tests to "really ensure" that there was no further medical treatment to be done. All costs of transfer and "medical care" and testing at the larger academic hospital would be covered by the donor network, and this was usually additional incentive for patient families to be willing to consider this, given cultural stigmas against organ donation. The transplant coordinator told me that occasionally the brain-dead patient would be found not to be brain-dead or that there would be additional medical treatments attempted, but that that was a small percentage.

wanted to do research that would make his country proud. And while many of the many informed consent meetings I observed raised no ethical questions, many conversations were cursory, and there were often difference between a completed task or a checked box and a thorough conversation attending to ethical concerns.

I would argue that He's research team placed national interests above their own – in attempting to do groundbreaking research which would push the boundaries of genetic engineering. The goal was to make a bold statement of capability – a moon landing, a deep-sea dive, a missile launch. He failed to play by the right rules, to adopt correct customs, to take the "appropriate" measures. But perhaps the real question is, what if he had? Had He just not fully assimilated to American research expectations and norms? Had his network of American colleagues failed to hold him to those standards?

Diane recognized that most Chinese scholars have a different (a *cultural difference*, she tells me) interpretation of conflict of interest forms. She noted that disclosure is seen as shameful and so conflict of interest forms are left blank and turned in signed. I wonder if conflict of interest sounds like corruption, and conflict of interest forms bear the hint of the Maoist struggle sessions of self-criticism. Similarly, I wonder if the scholar who changed the protocol is applying what he has learned from years on his unit (*danwei*), that if a leader asks you to change documentation of an event, you do so, regardless of what reflects a past reality (because what if you had misunderstood or misheard what someone said anyway? What if their correction brought the document closer to reality?).

I doubt that these Chinese researchers, who have their papers read and then quickly rejected by top journals, knew which behaviors or aspects of their submission got them rejected. I believe that these scholars *do* know the rules or scientific norms exist: they just may not recognize the importance of these rules or the ways their dismissal will reflect on their overall paper, and the data and science that is contained within. What is implied by any of these missteps (and numerous more) is a lack of insider knowledge which keeps these scholars (and their papers) on the outside of this revered and coveted club.

Diane goes university to university, department to department, trying to help scholars understand the publishing process and what it takes to publish in a high-impact journal. She compared herself to a mother, trying to nurture China's scientists and science. Even though she delivered the same material over and over again, often to the same audiences, she continued to see the same errors. She told me that she used to be angry about this, but soon recognized her own privilege: she had been seeped in the culture of her editorial office, where she was welcomed and encouraged to ask questions, mentored by senior individuals who helped her rise through the ranks. Other researchers had not and would not have the same opportunity to live her world, and so she wanted to bring a little of it to them. Despite the fact that she was born and educated in China, she now sees herself as separate from "local Chinese people." "*You understand*" she tells me.

Her own background is in medicine: she attended medical school, fell in love with a fellow medical student who trained to be a surgeon. Wanting to have a family and not seeing continued medical practice as compatible with her vision of being a mother and a wife, she chose instead to pursue medical publishing. She knew that she loved reading and she wanted to continue to be around doctors, to continue to be a scholar and stay abreast of the medical field. She sees the medical profession up close through the experiences of her husband, a surgeon in

Beijing, and through her job as an editor at this medical journal. She has been the Asia editor at the journal for over a decade, and as she tells me, this means she gets to meet and be inspired by the most well-respected and renowned Chinese surgeons, physicians, and researchers in the healthcare and health science fields.

She ended our conversation about her frustrations on this note: that she felt immensely lucky that through her job, she has been able to meet the brightest scientists and physicians in China, and she constantly feels inspires by their dedication to their work and to the progress of their country. She feels that no matter the negative media coverage of China, meeting these scientists give her a sense of deep pride for China's scientists and for their work. Because of her profession and her role within the journal, she interacts with the best of the best. She told me:

> I remember someone once told me in America, the elite people do business, they think making money is the most important. But Chinese, because there is a culture here of respecting scholars and those who seek knowledge, there's a saying that he who studies can have an official career (学而优则仕) [this means that] in China it means that the smartest people become politicians, and we don't produce Trump.

**Research as integration**

> I think publishing is a way for Chinese people to feel like they can become elite, to walk amidst the international tier of scholars – but what is that international tier? Really, America's system is broken, it's not worth learning from!
>
> I think it's interesting because in China people love comparing themselves to the US, and I think, why are we comparing ourselves to the US, what does the US have?
>
> (Interview with Diane)

The global assemblages of surgical practice exist within a rapidly shifting Chinese healthcare system and geopolitical tensions between (specifically) China and the US. My observations of surgical practice in China seemed to occur at the inflection point between two trends: a prior trend of globalization and interconnectedness over the past decades, and a new trend of increasing localization, with calls for decoupling between global powers and a sense that there is a need to build self-reliance. In this section, I discuss research publications as a form of global integration as well as a form of global technonationalism. As per the overarching argument of this dissertation, this ethnographic attention to scientific and medical publications provides example that integration and distinction are entangled: striving for distinction proves that comparison is already possible, that China is already a player in the game.

China is simultaneously underdog and global power. It sometimes feels as if they are throwing their body around just to get a sense of their own weight. Sometimes after hearing the way my interlocutors talk about their country, it feels like an anthropomorphized China is in her adolescence, just figuring out her life trajectory and values, wanting to prove how different she is from all the others, and simultaneously, just wanting to be part of the club.

In my extended anthropomorphizing, I think of the adolescent girl who feels completely alone in the world: that she herself is the only one who has experienced these growing pains, that her parents, her friends, her teachers, all do not understand and how dare they pretend to. I think of the girl who tries on a different persona every time she returns from summer vacation, trying to figure out who she is by trying on different faces and seeing how the world responds. The girl who desperately cares about what others think and tries so hard not to care.

Really, it makes no sense to characterize a dynamic, diverse, and ever-changing country as a single imaginary individual – part of what is so hard to pin down is the fact is the co-existent diversity of experiences which seem to resist the painting by a single brushstroke. Yet that is the image that always comes to my mind.

Diane tells me that she feels like China is at a historical turning point, and she sees herself (and me) as positioned to make a difference: "China really wants to integrate with the rest of the world, but it is not sure how to go about it. It needs people like us to help connect it with the rest of the world. China is really in a time of growth." Diane sometimes compares herself to a mother or nanny, wanting the best for her "children," nagging scientists and reminding them again and again what they need to do in order to be global scientific citizens and be accepted into the high-impact-factor-journal world (Manage your data! Have controls! Register your trials!).

She sometimes compares herself to a midwife: "I am helping them birth their child. I can only be the midwife – I cannot be the pregnant woman who has the baby for them." She cannot give them the ideas or produce the research herself, but she sees herself as a necessary and expert companion who is trained to safely guide a healthy (research) baby into the world. She sometimes compares herself to a director, "they are actors and I am trying to put them under the light so that people can see them." Their potential is already there, but they need a cheerleader, a champion, to provide space and a platform for their talent to shine. She compares the journal she works for as a allowing in the sunlight to showcase the best of medical research, and that she wants to place Chinese scientists and researchers by the window.

She does this also because she believes China has a lot to offer the world. I do too, perhaps, or I would not be writing this dissertation. In Diane's introduction at the CAMS conference, she speaks about how the health reforms over the past decade are evidence that the world has much to learn from China's example and experience. In our personal conversations, this take is tempered by the second opinion that China, while having a lot to share and a lot to give, has also a lot to learn.

### *Running before you can walk*

The ties that continue to bind China to an international community of scientists are most acutely showcased by the reliance on international collaborations in order to learn the ropes and publish in high-impact journals or impact scientific discovery. One of the major reasons to send PhD students abroad is for these students to develop connections with American or European institutions, with whom they can then continue research collaborations. Diane noted that many Chinese scholars cannot get their own datasets or do not know how to use it:

> I think China is still in a beginning phase and they have to start with collaboration – including this article you read by this scholar, who started by collaborating with

> University of Washington, with the IHME, you have to collaborate with people. But how do you find good partners?
> I think the top scholars get to publish in high-impact-factor journals via international collaboration. They don't understand either how to find collaborators, but we often try to find appropriate US or UK authors to help them get to that place. Or they are very smart and they identify good global researchers. You need to have someone teach you, you have to be guided. You can't just blindly go about it, or maybe you can and it will work in the end but it is very time consuming.

Diane continues to return to the need for mentorship in an education system which relies on apprenticeship rather than standardization. If you are apprenticed under a bad teacher, you will never learn. Finding an "outsider" collaborator gives a Chinese researcher insight, and integrates him or her into the international scientific community. However, as Diane told me, many Chinese scholars feel that this form of collaboration or learning is no longer necessary:

> I am very worried because there is recently a thought trend where people think they are already really excellent, and a very positive response, we don't need America, we are already amazing, but they don't see their own lacking. Some people think China is bad, and that's not accurate, but some people think China is too great, and they've lost perspective and don't know what tier they're on.

In my time at New China Hospital, I see this sentiment often. Increasingly I hear people say "we don't need them" not only about academic or training collaborations, but supply chain connections and legal or regulatory compatibility. Many of the scholars say that they had stopped going to the major medical conferences in America – partly because it was so expensive and tiring to fly (and these conferences were harder to get reimbursed by their departments) and partly because they felt their local or domestic, national conferences were more relevant to their academic practice and networks.

In October, a friend sent me a news release that New China Hospital and Mayo Clinic had signed a patent transfer agreement regarding the bio-artificial liver technology which had been developed at New China Hospital over the past few years. This marked the first time the Mayo Clinic (a very well-respected medical institution in America) and New China Hospital had signed a patent transfer agreement and there had been many press releases surrounding this news. Based on this agreement, the Mayo Clinic could use two patents developed by New China Hospital researchers which include a whole blood perfusion bio-artificial liver system and serum bioreactor which could simultaneously reduce treatment cost and improve treatment efficacy. In return, New China Hospital scholars would be working alongside this "world class team" in creating a bioartificial liver and have the opportunity to participate in clinical research regarding the project, having access to the data generated from this collaboration.

My initial thought reading this was to wonder how New China Hospital was benefiting from this agreement. Is getting the name of New China Hospital out there enough? Is it enough to be art of a cutting-edge research paper? Is it better to join the team than to lose in a competition – would it be naïve to think it did not have to be a competition? Commenters on some of the press releases asked "why are we giving away our technology to other countries?" and the first reply on this top comment read: "it's like back in the day when we had better tires,

and other people put our superior tires on their cars and then they had better cars, but we just had tires, we couldn't build cars yet." China is still learning to build the car – if they have the opportunity to contribute tires and learn how to build the car by being in the garage, this is still considered a great opportunity.

The original commenter replies with a thoughtful response: "thank you for your replies, it is just that in the current situation where they [their countries] are limiting us in such an unfriendly manner, I fell that there is a sense of frustration or disappointment, I think I wish for a bit more nationalistic spirit." The sense of frustration is palpable in the other comments below – the same sort of nationalistic "how dare these researchers sell out by giving away our hard work to Americans!" or "did we really get nothing in return! When will we stop being bullied?" But many of the responses to these comments echo the same sentiment – that China does not have the capability to apply this technology and the entire bio-artificial liver system. Hopefully, these commenters write, the agreement includes a clause that will allow New China Hospital a chance to train with the technology or to have access to this system at a lower price when it is ready to be used on patients.

The science, technology, and medicine sector in China has certainly had a period of exponential growth, yet despite the trajectory of growth, it wants to grow faster, reach higher heights. Diane noted her concern that some Chinese researchers do not think they need collaboration or help from international colleagues, that Chinese researchers, as a whole, sometimes do not see their own flaws, they lose perspective and do not recognize their own ability, or what tier they are on.

Diane told me her greatest frustration was that Chinese scholars so often looked for short cuts: ways to publish faster, skip the hard work, and have the reward. She told me about scholars who missed deadlines for competitions and asked to see if (because they were friends) she could allow for a submission which was a few days or a few hours late. I wonder if this is less about looking for short cuts and more about an overarching culture of loopholes and rules which are not really rules. But her many other examples of scholars who want to skip ahead in the line resonated: as one commenter wrote on the bio-artificial liver press release, "why isn't Mayo clinic giving us permission to use <u>their</u> technology; why are we giving them our patents?" There is still a clear power dynamic: a hierarchy of someone who has the upper hand with regard to scientific and medical innovation and research. I wonder if Chinese scholars (and of course, again, the inability to paint them all with one brush) are trying to run before they can walk, or whether they have decided neither are necessary before one flies or swims or travels in some other means, in some other direction.

***Politicization within a historical narrative***

Throughout my conversation with Diane, she continues to reiterate that China wants support from "*the outside world*." This sense of interiority/exteriority captures the dichotomy that exists in China's language around self/other. China, *zhong guo*, middle kingdom, and everyone else, *outside kingdoms*, *wai guo*, or outside (the) kingdom, *guo wai*. Products which are made domestically in China are referred to as *guo chan*, country produced. Though the major medical journals are dominated by native-English-speaking researchers, I wonder whether these journals will still be considered of the "outside world" if and when they were dominated by researchers from non-native-English speaking countries. Research and publications are a form of integrating worlds: becoming a part of the "outside" world, or merging these worlds, bringing one into the other.

Why is it that research is seen as proof of integration? Diane speculated that the importance placed on publishing in international journals is about earning respect not just from local colleagues but from the international community as well. She tells a story about the editor in chief Dr. Howell visiting a Chinese museum:

> Once he was invited to attend a meeting with Chinese museums, and I forget which museum it was but it was showcasing that most horrible part of Chinese history where we were being invaded and bullied by Japan and our editor said I finally understand why China wants to show muscle to the world – it's not that China wants to bully anyone, China is just saying, I'm strong now, I don't want to be bullied anymore. It is only after experiencing this, this period of terrible history that would make China want to show muscle now. They don't want to fight a war or anything.

The spectacle of history looms, not only in museums or within dioramas. The most popular TV soap series are ones which depict the Sino-Japanese war, "fighting the Japanese devils" is an entire category on any streaming website. Chinese soldiers are always shown as scrappy and under-resourced compared to the Japanese and Western forces, who shoot at them with cannons and rifles. The political rhetoric regarding science, as discussed in Chapter 1 and Chapter 4, is always that China is rising and will rise (*fuxin*), as evidenced by the rise in publications from Chinese scholars, in the rise of investment in biosciences, in the rise in the number of patents filed by Chinese scholars each year.

Science is political, and the measure or metric of numbers of publication, and specifically, publication within a high-impact elite journal is proof that China has what it takes to have a seat at the table or a ticket to the exclusive inner club or the chance to play on the same playground. Being able to publish in international journals becomes equated with being taken seriously or respected by the international community of experts and scientists. It does not mean that China wants to overtake others, or even that they want to conform to the "outside world": "*They still want to express themselves – it's not that as a Chinese you want to become America or become like Europe, but they want [outside world] people to respect them*."

But Diana made a point to remind me that this is not about doing it *better* so much as it is doing it *differently* – retaining Chinese-ness, not being erased, and continuing to be proud of their Chinese identity. I am curious about the friction between the need to conform stylistically but what it means to do so but still be a different perspective, a tension which seems to exist on both an individual and national level. She said to me in the same conversation:

> What is China showing their muscle for? Their goal is to say we are strong, do not come bully us. When they publish in [this journal] it is the same thing – we are strong. Not we can do what you can do <u>better</u> but we have something <u>different</u>, a different perspective, different way of doing things. And we are not wrong. America is always criticizing us – human rights, democracy, but just like our friends say, hey, we've made it. We've done the thing. While you were blah-blah-blah-ing, we did this thing. While you were arguing, we've already done this thing. So now we are running two experiments which are ongoing, and we will see.

> They're not competing with America they're just competing with themselves – they just want to be strong on their own. So, I really hate America because they're constantly saying we are going places and doing terrible things, like in South China sea, what terrible things must China be up to now. China doesn't have this type of ambition. China just wants to be friends with everyone now that I'm strong, let's play with each other. If you're playing, bring me along, but I really don't want to take your things. I'm rich now, I don't need your things.

The political nature of research success is upfront and on display in this excerpt of my conversation with Diane. I did not push her on her thoughts on human rights, military action, or democracy; it was evident from her conversation that the international critical narrative on China was a continuation of the bullying that China had underwent in the early 20th century. She told me that even Dr. Howell feels that the outside world is always saying negative things about China and sees his role as editor-in-chief (and specifically, an "activist editor," as he is often called) to show that there is good science happening in China, and good scientists. Diane of course recognizes that Dr. Howell sees a cherry-picked version of China, but both of them feel that that cherry-picked version of China is not on display often enough, and that highlighting this would slowly lead to a more nuanced and balanced understanding of the country and its researchers.

Diane notes that their journal's desire to report objectively on China, to state what is going on without necessarily taking sides is often seen by others as a willingness to engage with China despite its fundamental and structural flaws (specifically with regard to human rights offences). The journal, and Dr. Howell specifically, have praised China's handling of the coronavirus epidemic, though some have asked whether this support glosses over the silencing of dissenters and public martyrdom of whistleblower physician Dr. Li Wenliang.

Diane told me in an earlier conversation that Chinese scholars often similarly demand loyalty, and that research that came out of China or involved China tended to be easily and heavily politicized. They had recently published a paper using global burden of disease (GBD) data (which is compiled by the Institute of Health Metrics and Evaluation (IHME), an independent global health research center at the University of Washington in the United States). The controversy arose out of whether GBD data collected about the Taiwanese population should be considered as part of China. Chinese scholars, Chinese government officials, Taiwanese scholars, Taiwanese government officials and American scholars all criticized the journal.

> China likes to ask whose side are you on, whose side are you taking…Which side are you on, really? Because at first you said Taiwan is part of China and published that, why are you publishing the other side?
>
> It's very regretful, it is really a very narrow-minded view – Taiwan is in the middle of an election and used this paper to say that China is claiming their successes and said some really nasty things, like saying how do you have Taiwan's data? But really a lot of data is public, it's the American IHME analyzing this data, and placing it within a large framework. But Taiwan says this [article] makes it sound as if we [Taiwanese] report to China. We don't report to China, we are our own independent country.

> I think this is really narrow minded because in our research article we have never said that Taiwan reports to China. No one is reading the paper. They are just using the paper for a certain political aim. Including Taiwan Chen Jian Ru, the Vice President, and he has a public health background and I kept thinking you have a public health background, you are a scientist! Shouldn't you read the research methodology, why are you making up stories that we are saying that Taiwan reports data to China?
>
> And China is also asking, which side politically do you stand on? We don't have a political side! We just want to show the data. I think everyone is very nervous right now and no matter what you say people will have a reaction to it. Everything is very nationalistic now.

As Diane notes, research cannot be separated from political narratives: "objective" scientific knowledge becomes political in its characterization, in its use of labels, in whose data is included, in who gets credit. The political nature of knowledge production and debates about whose voice has authority in scientific publication or how certain authors or institutions gain authority have long been the topic of Science and Technology Studies (Biagioli and Galison 2014; Latour 1988; Kuhn 1996), China faces particular challenges in commandeering and claiming scientific authority.

Mason, in Chapter Three of "Infectious Change" asks what is wrong with Chinese science, noting that Chinese projects were often "mirrors" of studies which had been conducted abroad or studies which lacked credibility due to their failure to meet international standards (whether regarding data cleaning or informed consent). The highly-incentivized rush to conduct research in China, as researchers strive to join the transnational scientific community leads to harm: local populations are not protected, and unethical research is conducted. This chapter looks at how publications are made political: *why* there is such a push to publish and the barriers to publication which exacerbate the politicization of Chinese academia. While the data collection described in Chapter Two makes operations fungible for the purpose of research, publications allow the success of China's scientific or medical endeavors to travel globally. However, while the door is visible and open, it is one that cannot be entered: gatekeepers and barriers exclude China's knowledge and China's publications from the international scientific community.

## CHAPTER FOUR: CIRCLES OF INFLUENCE

The first times I visited New China Hospital (first in 2009, and then later in 2013, 2014, and again in 2017), the hospital or medical center seemed to be amorphously large. I had never seen the hospital as a patient, and therefore never entered through its main gates. Instead, I took side entrances, between dormitories and laboratory buildings, affiliate hospitals, and cadaver rooms. The buildings of the hospital seemed to sprawl far past any contained area, with a medical school campus across the street which was larger than any college campus I had visited, and buildings amongst shops and storefronts which seemed also to belong to the medical center. A few years ago, New China Hospital was the largest hospital in China, with over four thousand beds, a distinction which was taken away when another hospital expanded to surpass them, before the central government banned certain institutions from further increasing bed count to deter a seemingly endless the arms race between hospitals.

In my mind, I perhaps conflated the influence of New China Hospital with its size – there seemed to be no borders to this medical center, and it was impossible for me to comprehend the figure of four thousand beds: the largest hospitals in the United States are just over one thousand, and the hospitals where I trained as a medical student had under five hundred. (Perhaps more relevantly, while the number "four thousand" was always stated in the same breath as any introduction of New China Hospital, none of my American colleagues seemed to know the bed-count of their institution and did not seem to correlate the number of beds in a hospital to its prestige or quality of care.)

In time, I came to realize that the main medical campus was quite contained: four large high-rise buildings, each over ten stories high, housed the outpatient clinics and inpatient wards of the adult hospital. The second affiliate hospital was for obstetrics, gynecology, and pediatrics; a third affiliate hospital was for dental and oral surgery; a fourth affiliate hospital was for occupational health and industrial injuries. But the hospital, or at least, something about the hospital seemed to reach far beyond the physical confines of these buildings.

In the early weeks of my research, the professors and residents I spoke to about on-call schedules and daily workloads often mentioned that they were picking up extra shifts because individuals had been "sent off" to other places – Xinjiang Province, Tibet, the African continent. These were the names I recognized, but they named other cities too, which I later learned were cities within the same province; listed in the same breath as Uganda and Tibet, they may as well have been a long plane-flight away. Various professors were always either just back from these other places or about to leave the elite, inner-circle world of the main hospital. Though these professors were physically in other locations, they were still New China Hospital professors, and thus, their presence at other places seemed emblematic of the tentacular reach of this medical center.

Not long after arriving at New China Hospital, I realized that the professors I worked with would disappear soon after the departmental morning report, occasionally leaving early, if the meeting ran past 8:00 AM. I assumed they were leaving to make clinic on time or to be at the operating room early, until one professor, Dr. Chao, mentioned that he was going to another hospital and invited me to come along. I began taking these weekly trips with him, and when leaving the hospital, I watched as other professors I recognized also walked out the back-entrances of buildings, leaving the hospital campus entirely, getting into unmarked cars with waiting drivers, and departing for the day, ostensibly to other hospitals, to other clinics, or other jobs. Though New China Hospital seemed large to me, with four-thousand beds and four tall

towers, I was slowly seeing the expanse of the hospital and its reach far beyond physical buildings and manicured medical campus grounds.

Dr. Chao grew up in Valley City; his father was a laboratory technician at New China Hospital, and his mother was a nurse in the same unit where he now works as a gastrointestinal surgeon with a focus on gastric cancer. He once told me he had a hard time commanding respect from older nursing colleagues because he had spent many weekend afternoons as a child under their watchful eye. He was born in the hospital, grew up in the hospital staff housing, played in the hospital hallways growing up, ran around on the hospital campus as an elementary school student, attended medical school as an MD/PhD student training at this hospital, and was employed soon after. The hospital was always his home, and continued to be his home.

When I met him, he was an associate professor at New China Hospital and a consulting surgeon at Longquan hospital; every Wednesday he would go over to Longquan, and I often tagged along, attempting to understand the relationship between that hospital and West China, as I tried to map out New China Hospital and its associated worlds. A few months later, he was promoted and sent to Yibin as Vice President of one of the newly-allianced public county hospitals. A few months later, in capacity as vice president of that hospital, he was sent to Wuhan, leading a group of healthcare professionals from all over this province to aid in the fight against coronavirus at a converted field hospital for coronavirus patients requiring intensive care. His wife, a pulmonologist, left for Wuhan as well, soon after, though in their time there they were stationed at different hospitals and never saw each other despite being in the same city away from home.

He wrote a WeChat post on his daughter's fifth birthday, which accompanied a picture of her in her thick glasses and plaited pigtails:

> This year, your father once again cannot be by your side to celebrate your birthday
> And your mother also cannot be by your side to celebrate your birthday.
> There is no cake to celebrate you, in your sensible wisdom.
> You say to your friends that when you grow up you want to work at New China Hospital
> When we ask you why? You say: Because then I can see my parents every day.
> When you grow up, I'll explain to you about SARS; I'll explain to you about Wenchuan;
> I'll explain to you about Wuhan.

I cry reading his post. Partly because it is beautifully written, partly in pre-emptive sadness for my hypothetical children's birthdays that I will inevitably miss, partly because I sense his sadness, the friction between a sense of duty as a physician, a party member, a hospital administrator, a citizen of his nation, and a sense of duty as a father, a desire to be with his daughter on her birthday, a visceral knowledge that this time will never return.

Even for his five-year-old daughter, his father *is* New China Hospital, and New China Hospital is her father: to be on location is to be with him, and so her goal when she grows up is to work there, without knowing what working there entails. She equates his absence from home as his presence at New China Hospital; in the last lines of his letter to his daughter, he makes clear that his absence is an absence to other worlds: to Beijing during SARS, to Wenchuan during the earthquake, to Wuhan during the coronavirus epidemic. B;ut even in his journeys to these other places during times of crises, he goes as a New China Hospital physician.

Dr. Chao is always *of* New China Hospital but he is now rarely *at* New China Hospital. His professional trajectory maps the growth and expansion of New China Hospital over the past

three years. As New China Hospital expands, he rises through its ranks, and in my various visits to New China Hospital over months and years, I am lucky enough to witness it. The story of medical alliances is the story of Dr. Chao: an individual enacting the collective hopes of a nation enacting and undergoing extensive medical reforms.

***New Medical Reforms: a focus on tertiary over primary care***

The Chinese public's complaints regarding the Chinese medical system can be summarized in six characters: "*kanbing nan, kanbing gui*" – roughly translated as "medical care is too inaccessible, medical care is too expensive." Amidst the popularization of the six-word idiom and the rise of violence against physicians, the wave of "New Medical Reforms" which began in 2009 sought to address known disparities between urban and rural medical systems. The state documents which introduced these reforms highlight the importance "[allowing] *all people* to share the successes and achievements of healthcare reform" (Opinions on Deepening Health System Reform 2009) (emphasis mine). The promotion of widespread health, as part of a focus on "egalitarian and equal access to opportunities and growth" (a phrase popularized by Hu Jintao), was seen as crucial for "social harmony."

The changes that occurred as part of these medical reforms were striking. Over the past ten years, the Chinese government quadrupled government spending on healthcare, provided universal insurance coverage for 96% of the population, and established free public health services for all (Yip et al. 2019). Access to healthcare increased, with 18% increase in hospitalization and increases in healthcare utilization across all socioeconomic classes (National health Commission 2018). The increase in governmental investment in healthcare was most conspicuous in rural areas, where 80% of funds for rural insurance schemes came from government (Meng et al. 2019). In reflection of these efforts, there was a significant decline in the proportion of patients who were recommended inpatient treatment but did not seek it or who needed hospital care but could not afford it (Center for Health Statistics and Information, National Health and Family Planning Commission 2015).

Researchers in China, as well as in the United States and United Kingdom, lauded these achievements. However, many expressed, both in private conversation and in the public forums of academic conferences and medical journals, that China had gone in the wrong direction. At a biannual conference co-presented by *The Lancet* and the Chinese Academy of Medical Sciences (CAMS), held in 2019 at Sichuan University, Winnie Yip (an American professor of Public Health) noted that the challenge for China within the next decade would be to invert their healthcare expenditure to focus more on primary care, and less on hospital services, in order to better address an aging population with increasing burden of chronic and non-communicable diseases (Yip 2019). Yip pointed out the continued concentration of health expenditure in tertiary hospitals, and questioned whether the increase in hospitalizations and expenditures necessarily indicated that patients were paying for high quality care and effective health services.

China's New Medical Reforms have in fact focused on tertiary health settings, with public hospitals account for 60% of total health expenditures (Meng et al. 2019). Low use and poor capacity of primary healthcare providers is a continued challenge, and increases in medical expenditures per patient pose a significant burden for poor households, despite near-universal insurance coverage, due to incomplete reimbursements for hospital care.

At the Lancet-CAMS conference, spirited debate after Yip's presentation questioned why China had chosen to follow in the footsteps of the United States, with strong tertiary care

hospitals and a weak primary care system, rather than following the lead of the United Kingdom, with a strong network of General Practitioners (GPs) and a centralized medical system with coordination of care via community GPs. Despite primacy of primary care in the policy documents which spurred the New Medical Reforms, why have tertiary care hospitals continued to dominate healthcare expenditure and governmental and institutional investment?

Since its introduction in China in the late 1800s, biomedicine and Western science has been seen as a key instrument in the transformation of a vulnerable, bullied, and poor nation into the wealthy and modern global power that China's leaders and people aspired to be (Schneider 2003; Elman 2006). Science and technology have been fundamental to modern governance in China: they were first touted as one of the Four Modernizations in post-Mao regimes, and the subsequent rise of science and technology and its role in society and governance has led to what some have called a "virtual technocracy" in past few decades (Cheng and White 1991; Li 2001; Greenhalgh 2010; Baum 2019; Lee 2002).

Throughout rounds of economic reforms in 20th century China, party leaders emphasized the tie between managing the health of bodies, health of the general population as labor force, and health of the state. In a news article published by the State Council about the newest policy documents on medical reform, Premier Li Keqiang stated in an executive meeting that meeting the "great demands in healthcare" was necessary to "drive the country's economic and social development" (Yue 2017). Not only is the strength of the population crucial for the economic development of the country, failures in the medical system leads to catastrophic consequences for the country, on economic and geopolitical grounds. Any epidemic highlights the importance of a strong public health system: the Manchurian Plague of 1911 established the importance and superiority of biomedical and germ-theory based approaches (Wu 1959; Lei 2016), and the severe acute respiratory syndrome (SARS) outbreak in 2003. transformed China's once grassroots and rural focused public health approach into a highly professionalized, internationally-oriented, and scientifically-minded enterprise (Mason 2016). The SARS outbreak served as a forceful reminder that healthy societies were crucial for social and economic development (Meng et al. 2019), and epidemics and poor healthcare could contribute to a slowdown in economic growth or overall modernization.

The most recent novel coronavirus (Covid-19) pandemic which began in Wuhan and necessitated a complete economic shut down for several weeks was further proof of the importance of a strong healthcare system in sustaining a strong economy. However, the Covid-19 pandemic also highlighted the importance of scientific and biomedical infrastructure: the investment in scientific laboratories allowed for the ability to sequence the viral genome and to develop testing kits. Tertiary care hospitals with intensive cares rapidly reached capacity and the extensive investment in hospital construction over the past decade allowed for rapid construction of additional field hospitals to meet medical needs. Political leaders lauded the strength of the medical system in its ability to respond, both in rapid construction of hospital buildings and in the rapid deployment of medical professionals from other provinces. The response to Covid-19 in China was a combination of state force, technological tracking, and tertiary care hospitals, rather than mediated through primary care physicians and community outposts.

While reflection and retrospective analysis will provide further clarity on the success or failures of the Chinese medical system and its response to Covid-19, the epidemic highlighted the significant role and importance of tertiary hospital care in China's modern healthcare system, and the perils of its insufficiencies. "*The eyes of the world are on China, and we are showing them that our healthcare system is strong*" stated one Wuhan government official during an early

press conference, several days after the city-wide lock-down began. In this pandemic, the official asserted, the modernity and strength of China was reflected in the modernity and strength of its healthcare system.

Though community-based primary care has been one of the tenets of the New Medical Reforms, primary care systems in China continue to be weak and resources have been largely focused on reforming hospitals, which deliver secondary and tertiary care. Primary healthcare doctors in China continue to be inadequately trained, and medical providers in rural areas are often unlicensed individuals who have not completed medical college (Li et al. 2017). These medical providers are underpaid and have low job satisfaction and high burnout rates, and changes in financial incentives (e.g. at-cost pharmaceutical drugs) have resulted in unintended consequences such as increased drug prescriptions to increase revenue and failures to deliver improvements in quality of care (Lu et al. 2017).

In the first five years of the New Medical Reforms, a majority of the healthcare reform expenditure was invested in hospitals rather than primary healthcare facilities (Qian et al. 2017). Given the lack of government support, patients have not shifted their healthcare practices towards primary health care, expressing distrust of the quality of primary healthcare. Such skepticism is not unfounded: recent studies sent incognito standardized patients with a pre-determined set of symptoms to see primary care physicians in village areas and found that 41% of diagnoses were incorrect and that 64% of prescribed treatments were unnecessary (Sylvia et al. 2015; Sun, Rasooly, and Jian 2018). As China has not implemented a gatekeeper system, most patients bypass primary care and go directly to hospitals (Qian et al. 2017). Economic incentives reinforce this decision, as most insurance policies provide higher reimbursement for inpatient services, and patients therefore seek hospitalization for minor health conditions.

This behavior is also mediated by a desire to seek the best possible care, regardless of health condition. One patient said in an interview, “if you have the means to see the expert, why wouldn’t you see the expert? And now that many of us can afford it, it is not so expensive. I want to see the best doctor that I can afford.” The process of getting an appointment (*guahao*) at tertiary hospitals as a democratic one: at many hospitals, one can book appointments online with any physician, as long as there are available slots. Slots for experts (*zhuanjia*) often book weeks in advance, despite an aggressive crackdown on scalpers who used to sign up for appointment slots and then sell them day-of for sky-high prices to desperate patients. The price of outpatient appointment with a junior professor is less than the cost a McDonalds meal (35 RMB, or 5 USD), and “expert” physician visits are not much more expensive, so there is little disincentive to seek an appointment with an expert. Patients assume that these expert-level professors will provide the best care, the most accurate diagnosis or the most effective treatment, regardless of whether this is true, despite attempts to strengthen primary care. The primary care system is further undermined because patients return to specialized physician for primary care questions if they find a physician they can trust. One of my friends, who had undergone spinal surgery almost a decade ago, told me: “it’s hard to find someone you trust. It doesn’t matter that Dr. Z is an orthopedic surgeon. He’s managing my father’s hypertension because I trust him.”

Despite ongoing reforms, most health services, resources, and expenditures continued to be concentrated in high-cost tertiary care hospitals. With patients insisting on seeking care at these hospitals, patient beds at these tertiary academic hospitals were limited and patients continued to experience difficulty in seeking care, with long wait-times for outpatient appointments or for inpatient admission. Additionally, as most patients continued to seek

medical care at tertiary hospitals, healthcare costs remained high. Tertiary care hospitals bill at higher costs for the same services, given higher overhead cost for a large number of highly-specialized departments as well as ancillary services. Furthermore, healthcare insurance programs reimburse tertiary hospital costs at a lower ratio than lower levels of care, resulting in higher out-of-pocket expenses for patients overall.

Thus, a crucial component of encouraging more equitable and accessible healthcare was pushing patients to seek care at lower levels of care. The "tiered diagnosis and treatment system" (*fenji zhenliao*) describes a softer version of a gatekeeper role: by encouraging "tiered diagnosis," diagnoses would be made at a grassroots level, with smooth referral process either to a lower or higher tier of care for appropriate treatment (Recommendation Regarding Comprehensive Reform of County-Level Public Hospitals 2015). Thus, public county hospitals emerged as the link between the resource and talent-rich urban hospitals and the rural community health centers, health stations, and clinics. If urban hospitals could support and strengthen county hospitals, county hospitals could then lead rural health service networks.

Thus, the original goals to strengthen the primary health system were replaced with policies emphasizing the role of county hospitals in bridging the gap between rural and urban medical systems, creating structures for the movement of physicians and patients between medical institutions. Within the recommendations for reform of county-level hospitals was a call for medical system innovations which would allow for smooth "two-way referrals" to better execute the "tiered diagnosis and treatment system" which was recommended to lower healthcare costs, increase efficiency, and provide more equitable and accessible care.

*Hospital alliances and integrated care*

In 2017, the General Office of the State Council released a policy document (*guobanfa* 2017 No. 32) "Promoting the Construction and Development of Medical Alliances (*yiliao lianheti*)." The document, one in a long string of major policy documents since the beginning of New Medical Reforms of 2009, called for the development of medical alliances[35] as a key innovation and structural reform necessary to optimizing the Chinese healthcare system, allowing resources to trickle-down and improving the capacity of rural medical centers. The goals of the medial alliances were to address the uneven distribution of medical resources and talent, the rising costs of medical care and pharmaceutical drugs, and the lack of collaboration between medical systems leading to inefficiencies and redundancies of care.

Medical alliances represent a form of structured integrated care, which has been touted internationally as a cost-effective solution for often fragmented and poorly coordinated care of patients with chronic non-communicable diseases. The WHO defines integrated care as "the management and delivery of health services so that clients receive a continuum of preventive and curative services, according to their needs over and across different levels of the health care system" (Integrated Health Services - What and Why? 2008). Given the shifting demographics and epidemiological disease burdens of the Chinese population, healthcare alliances provided a possible solution to bolster a healthcare system which could adequately address an aging population with significant non-communicable disease and chronic disease burden. Medical alliances had been piloted in various cities since the call for innovation of public hospitals in the 2009 New Medical Reform policy documents, and the vertical "green channel" referral systems

[35] Medical alliances are sometimes translated in policy and research documents as medical consortiums, or hospital-community health center collaborations. In Chinese, *yiliao lianheti*s often shortened to *yilianti*.

between health facilities and integration of patient records to share medical information were shown to improve accessibility and coordination of care, though minimal research had been conducted on their effects on quality or cost of care (Xu et al. 2016; Shi et al. 2015; Qian et al. 2017).

In 2015, based on initial pilot alliances, state policies encouraged the development and piloting of hospital alliances in order to further the goals of medical reforms ("Guiding Opinions on Pilot Urban Public Hospital Comprehensive Reform" 2015). These medical alliances would "take advantage of the concentration of high-quality resources in third-tier public hospitals and rely on these hospitals to lead lower-tier medical institutions through technical assistance, shared resources, and training and education of personnel" (Guidance and Opinions on the Establishment and Development of Medical Alliances 2017). This 2017 document formally introduced the development of medical alliances and provided opinions on the goals of its implementation, emphasizing that this innovation was rooted in the strength of science and technology as a force for improving the performance of the medical system overall.

Providing objectives and a timeline for implementation, this document also mandated that *all* third-tier hospitals participate in or spearhead hospital alliances of their own by the end of 2018. By June of 2019 there were 1860 medical alliances led by urban public hospitals, 3129 count-level medical alliances, over 2400 inter-regional specialist alliances and over 5600 telemedicine networks for remote and rural areas. Almost all alliances included the establishment of two-way referral "green channels"; 2018 was the first year that saw an decrease in transferring patients to a higher level of care and an increase in transferring patients to a lower level of care (State Council Information Office 2019).

State officials also acknowledged that the needs of each community or region were different, and that hospitals should choose a form of integrating and cooperation that would work well for them, given their particular needs or challenges: "all local regions should take into account the local conditions, considering the geographic distribution of patients and resources, the service capacity of the medical institutions, and the willingness to cooperate of medical institutions involved" (Guidance and Opinions on the Establishment and Development of Medical Alliances 2017). Thus, any given hospital could participate in a variety of different forms of medical alliances, determining what worked best for the partnership between the academic-tertiary hospitals and the lower-tier community hospitals. The development of many of these alliances have been organic and over time, though spurred on by the encouragement of state mandates and incentives, the growth of networks and alliances, often overlapping and intertwined, seemed exponential during my year in the field.

### *From Competition to Cooperation: Medical Alliances at New China Hospital*

Though the term "medical alliance" arose based on a medical alliance piloted in Zhejiang Province in the 2016, New China Hospital had been exploring collaborative service models since 2010. Though New China Hospital had always been a strong hospital in the Western region, founded by Canadian missionaries and one of the missionary hospitals which survived the tumultuous early decades of the People's Republic of China, under the leadership of late President You YingKang, New China Hospital went from a regional name to a national powerhouse, well regarded for its size, academic research, clinical care, and lean models of medical administration (Li 2012).

The growth of the hospital and its success over the decades had been studied by many other hospitals, and policy leaders and other hospital administrators began to look to New China Hospital for their models of management and innovative approaches to hospital care. New China Hospital's medical school was one of the first academic institutions to offer a PhD in administrative and hospital management, and many hospital leaders and department chairs from around the country continue to visit or study at New China Hospital to learn from its administrative models. In 2012, Li Weimin, who later became president of New China Hospital, wrote a book titled "From Competition to Cooperation: Lessons from the Collaborative Service Model at New China Hospital" as part of a series on New China Hospital's management practices which sought to present a scientific approach and practical guide for those trying to learn from and emulate the hospital's success.

His text, written in the early years after the 2009 New Medical Reforms and prior to the 2015 public hospital reforms, provides insight on early views of medical alliances and collaboration which shaped New China Hospital's implementation of the 2017 nationwide call for medical alliance development. The book introduces the idea of medical system *cooperation* rather than *competition*, extolling the virtues of this model and arguing for its economic and medical necessity. Li's "regional medical service coordination" (*quyu xietong yiliao fuwu*) involves coordination between hospitals, bi-directional transferring of patients from village clinics to urban hospitals and back, the development of telemedicine clinics, and validation of diagnostic and laboratory tests done at other medical institutions. He writes of the importance of state-level regional coordination for medical services like drug distribution, laboratory data, and electronic medical records, and the need for coordinated supervision of medical care in a region.

*A single bloom does not herald spring*

Li writes in his text that by modern scientific principles, New China Hospital's success could be considered an anomaly unless it could be replicated and that knowledge and success could be shared. Reproducibility is a core tenet of biomedical research, an Li believed that West China's model could only be considered worth emulating if it could truly be emulated. A true alliance would be one in which the standard of care would be universal across medical institutions, raising the bar for the medical management of patients wherever they sought care. Li believed the quality of care at New China Hospital could be implemented at other institutions, and that the lessons learned from managing such a complex, large, and unwieldy hospital could be used to improve the management of smaller hospitals or hospitals in other locations that faced many of the same challenges.

Under his leadership, New China Hospital developed a reserve of "high-potential young talent" who underwent systematic training curriculums which covered various aspects of hospital management. Each individual recruited into this collective was expected to take a number of seminars and training programs, and upon graduation and receiving an official certificate, they were considered ready, should a position in management arise. The training program was not advertised – one had to be nominated and selected, and each training cohort was kept small.

Dr. Chao was recruited into this program in 2016, when the program first began. Prior to the establishment of this training, when physicians were moved into management positions, they learned on the job, often requiring long periods of time to be onboarded given a steep learning curve. While those already in leadership positions (department chairs, heads of nursing, etc.) were provided with administrative training, those who were younger and not already in positions

of leadership could not access these training programs. The "high potential young talent" reserve aimed to solve this problem, and sent each of the trainees to hospitals in Singapore, Hong Kong, Japan, and Taiwan, to learn from various healthcare systems and leadership styles.

In my conversations with another young attending who was recruited to this program, he provides me this analogy. If New China Hospital was a single bloom, this collection of "high-potential young talent" were pollinators, flying from New China Hospital to other hospitals, collecting their best practices, and returning to their home institution to share, compare, and discuss. When considered "mature" and ready, these pollinators would then be dispatched out into the "wild," where they could pollinate the uninitiated county hospitals. Only when all institutions had been visited by West China pollinators would they all come into bloom; only then would spring have arrived to this region.

In the years since the publication of Li's book in 2012, ten medical alliances have been formed with New China Hospital, with many more in various stages of planning. All of these hospitals are county or district level public hospitals: half were tier 3A, and the other half were either tier 3B or tier 2A (in practice, a 3C tier was rarely given to hospitals). In total, these hospitals had nearly 13,000 beds (figures from internally circulated documents at New China Hospital). Not every alliance follows the same model as the needs of each hospital are unique to their patient population, hospital size, and local management. Many of these alliances were formed with the support of local county governments which encouraged county hospitals to join alliances with New China Hospital, often providing a financial incentive to do so.

The goal of healthcare alliances is to take the knowledge which has accumulated in the expert-level academic tertiary hospitals, and to spread the wealth, to have this knowledge trickle-down to lower-tier hospitals – first to county hospitals, and later to community hospitals, and eventually, to primary care centers. Dr. Chao tells me that New China Hospital has an edge and has risen through the rankings because of the strength of its management:

> If we are able to spread the strength of our hospital management to the community, that will lead to the success of [China's] healthcare system overall. [New China Hospital's] superiority is not just our clinical edge, but our administrative edge and experience, our ways of thinking, our values, our systems – if we can pass all of these down to community hospitals, that's how we help them modernize. Even though they have the facilities, a lot of modernization has yet to have happened, with regard to management values and ideas – in these community hospitals, there are so many loopholes and imperfections.

Per Dr. Chao, modernization means systematization. He tells me that they are trying to establish rules and regulations so that there are contingency plans in place and resources available if situations arise: "if you have regulations in place, if there is a new person on the job, they can read the regulations and know very quickly what they are supposed to do." Bringing these rules and management guidelines to community hospitals is part of the goal of medical alliances, but their establishment is not without backlash. Rules make charismatic leaders dispensable, and certain personalities are more aligned with the goals of these alliances than others.

Hospitals which join the New China Hospital medical alliance add the name "New China Hospital" before the original name of the hospital. Thus, "Longquan District No.1 Hospital" becomes "New China Hospital Longquan District No. 1 Hospital." The presence of New China

Hospital is often announced throughout the building, with large banners at the entrance of the hospital, and engraved placards with the names and faces of New China Hospital consulting physicians. Large red banners hang over the main elevators, and there are often neon posters which list the clinic times of New China Hospital physicians at the alliance hospital. The visible advertisement of New China Hospital's presence is part of what helps draw patients to the hospital. Patients who want to see a New China Hospital specialist can do so at this county hospital, which is closer to home, more convenient, and often provides more appointment availability than New China Hospital, where appointments are notoriously hard to come by.

How much an alliance hospital changes after joining New China Hospital's medical alliance depends on what type of alliance or contract they form. At the highest level, the top levels of management become New China Hospital people, allowing for massive shifts in hospital policy, the hiring and firing of many individuals, and the build out of their own medical collectives with smaller county hospitals. But even when the alliance is a looser form, the presence of New China Hospital physicians even in a consultancy role shifts what the hospital is able to offer and encourages the trickling-down of certain priorities and certain forms of knowledge.

As part of their contractual agreements, New China Hospital usually sends five to ten physicians, one each from a medical specialty (e.g. general surgery, pulmonology, cardiology, orthopedic surgery, neurosurgery, radiology, etc. depending on the need of the region and of the specific hospital) to serve as consulting and advisory physicians. Each of these physicians acts as a regular consultant at the alliance hospital, seeing patients at the alliance hospital at least one day a week. They are also generally available to the department as consultants for challenging cases, and to serve as an advisor to help develop and promote departmental academic or research activities.

*Square Peg Round Hole: Gerbils in an Academic Rat Race*

At one of my visits, I joined Dr. Chao, who had been a consulting physician at Longquan Hospital since the beginning of the alliance partnership in 2017. That morning, he was holding a teaching conference in preparation for a local multi-disciplinary conference in order for the alliance hospital to have the experience of hosting and participating in a multi-disciplinary conference: "it's important to promote this sort of interdisciplinary approach: it's a different way of thinking about patient care than they are accustomed to. They used to come to our events and learn from our experts, but I really want to encourage them to host themselves, and to lead in this area."

The department takes his visits seriously, even though he is there every week. They treat him with a level of respect he certainly does not get at New China Hospital, where there are more senior physicians and where even the most renowned physicians are treated with a sort of callousness. In contrast, at Longquan, a driver comes to pick him up, and when he arrives at the department of general surgery, there is always breakfast waiting for him. As I have joined them that week, they ask to take a photo, and arrange all of the physicians in two straight lines below a red banner, with Dr. Chao and myself front and center. One of the head nurses takes the photo and as she shows it to me to check, she tells me, "see, it is because of great physicians like Dr. Chao and the collaboration with New China Hospital that we have international scholars like yourself come visit our humble hospital!"

County hospitals, which were previously purely focused on clinical care, have begun to attempt an academic or research role, and many of the hospitals seek alliances with New China Hospital in order to build up their academic abilities given New China Hospital's own success in reaching prominence through research and publication. Dr. Chao's role is to help transform their department of General Surgery into a department which can conduct research which they have previously found too intimidating or challenging. Though many of the staff physicians at these alliance hospitals have received graduate degrees beyond undergraduate medical training, after leaving the academic setting and coming to work in a county hospital, they no longer have the resources or time to do research, whether laboratory (bench science) research, clinical research, or translational research. Most county hospitals do not have laboratories for basic science research, which are expensive to build and to run and have very variable return on investment.

Dr. Chao tells me that while it is not possible for these physicians to do basic science research, they also do not do clinical research: they are not involved in data collection, nor do they have access to large databases, and thus, they are not writing papers. While Dr. Chao says he has spent the last year encouraging the staff physicians in this department to write up papers and has provided them with starting points and ideas, but they still have not. He tells me:

> They feel like doing this sort of retrospective review is too time consuming and too much work and they don't have time because they don't have their own research students and to do so on their own is too big of a challenge. And here, they're not really used to the idea of working overtime the way we are at West China where it is completely normal to work somewhat insane hours - they can't keep up or tolerate that type of work load.

Dr. Chao refers to his own work schedule, where he works a full clinical schedule and often does research at night or on weekends. His days are filled with administrative meetings, multi-disciplinary tumor conferences, and research meetings in addition to his clinical duties. Another consulting physician from West China tells me that he has observed often that physicians at county hospitals will go home if they are done with their cases for the day: "there is no motivation for staying a little later and reading a paper, because they do not believe that that that behavior will benefit them in any way. They would rather either work more clinical cases and make a higher bonus that month and save to invest in the stock market or in a side venture. Why should they do research?"

However, staff physicians at alliance hospitals often told me that the consulting physicians who came from New China Hospital do not understand their lives. In one interview, a frustrated staff physician said:

> They don't understand us; our lives are very different. We don't have residents and fellows and medical students who are writing our patient notes and communicating with patients and their families to get them to sign consent papers. They don't have to see patients in the emergency department. They only need to operate and go to clinic, and all of the paperwork is done for them.

While this is somewhat exaggerated, the basic comparison is valid. Because New China Hospital is a teaching hospital, much of the paperwork is done by residents, visiting fellows, and medical

students. Public county hospitals have no additional labor to their staff physicians – while there are often a few residents who are there in training, all staff physicians must do time-consuming charting until they are promoted to senior attendings or department chairs. These physicians express exasperation, that their normal workloads are not being adjusted but additional expectations have been added: they have been dropped into the rat race without consent, and they feel out of place and ill-equipped.

The pressure for public county hospitals to develop an academic focus originates from the state policy documents which state one of the goals for public county hospital reform and medical alliance development as the improvement of medical research capacity at county hospitals (State Council Information Office 2019; Recommendation Regarding Comprehensive Reform of County-Level Public Hospitals 2015). The motivation for county hospitals to develop research productivity arises from the reliance on rankings to draw patients to hospitals, and the importance of publications and academic productivity on a hospital's position in rankings.

Whether the ability to publish in a big-name journal actually impacts the quality of care is irrelevant. In an interview, the editor of *The Lancet* tells me a story of a family medicine doctor who had an abstract accepted at the Lancet-CAMS conference several years ago. Though the acceptance of an abstract is significantly different (and much easier) than acceptance of an article to the journal itself, the woman became a local celebrity at her hospital and in her community. Media articles lauded her for her successful publication and her local community hospital printed a banner with her face and the abstract of her paper to publicize her work. Thus, in order for a hospital to rise in rankings and in reputation and attract more patients over competitor hospitals in the same region, most departments have made academic productivity one of the criteria for promotion, resulting in pressure for staff physicians to publish, despite not having dedicated time for research, and often without the resources or training to do so.

New China Hospital doctors often focus on this difference in training and educational background. As one of the most prestigious hospitals in China, with one of the most competitive medical undergraduate programs to test into, physicians at New China Hospital are accustomed to working with colleagues who have gone through rigorous and standardized training. Dr. Wu, another New China Hospital doctor who serves as a consulting physician at a different alliance hospital, once explained to me what he found the most surprising about the differences in quality of care at county-level hospitals and at his home institution:

> The past few years I've been at this [alliance] hospital, I've realized the quality of doctors at these community hospitals is sub-standard because they've never had the support or resources of [New China Hospital] to go through training, and all they know is what they see every-day – gallbladders and appendix surgeries – their perspective is very limited. More importantly, they don't have the social and professional pressures to further their own knowledge. They don't see or know where their knowledge gaps are.
>
> When I first came here, I realized they didn't know about international guidelines or standards of care, so I asked them to look into these guidelines. These are the most basic things one needs to know, and not knowing these guidelines actually really contributes to a lot of the patient-physician conflicts that arise. If you follow the guideline, you can say, I did what anyone else would do and that is the correct thing to do according to a lot of research. There is so much more patient-

> physician conflict at the community level and patients have absolutely no trust in their physicians. If the physicians don't know what they are doing, it does not surprise me that patients don't trust them.

Dr. Wu and Dr. Chao both mention to me the difference in physician "quality" and therefore the quality of care which is delivered. Both of them feel that there are fundamental differences in the ways that patient care is delivered, in how patients are seen. Though there is of course heterogeneity amongst county-level physicians, the generalization often holds true.

Dr. Chao encourages his county colleagues to begin conducting basic research; Dr. Wu encourages his county colleagues to learn and practice based on guidelines. Their experiences demonstrate the 'trickle-down' ideal in practice – that by sending individuals from academic tertiary hospitals to county hospitals, they are bringing medical knowledge and practices with them. The trickle-down effect extends further – many county hospitals are now leading their own medical consortiums with smaller community health centers in rural areas, like Russian nesting doll, or dominos, one encapsulating the other, one affecting the other, and spreading wealth and knowledge. The idea is that the presence of these individuals at lower-tier hospitals keeps patients at these hospitals and in these regional areas, encouraging patients to seek care at their local hospital, or even local community health center, rather than traveling long distances to seek experts at urban academic centers. Per the policy reports that cite the number of outpatient and inpatient medical visits made at the county level vs. the academic tertiary hospital, even if a small percentage of patients stay because they feel they can access expert care at a local level, the implementation of this plan will have succeeded.

*Strange Bedfellows: Sharing a bed, but dreaming different dreams*

In Li's text on cooperation vs. competition, he argues that the integration of medical systems is crucial for more efficient care overall, that by sharing resources, information, knowledge, via technological and information systems, via the smooth transfer of patients and the legal ability for physicians to practice at multiple institutions, all medical institutions will benefit, as will the patients who seek care within a region. The challenge with this vision (and with the vision of medical alliances) is that individual hospitals are not motivated to do this on their own, lacking both the resources and vision to do so. Li therefore calls for government support of this form of collaboration; the medical reforms and state documents in 2017 *mandated* involvement of all tertiary hospitals and all public county hospitals, forcing hospitals to build out these collaborative models and providing strict metrics by which their implementation and the success of their alliance would be measured and evaluated.

Given this forced collaboration, Dr. Wu described the medical alliances to me as strange bedfellows, comparing the academic tertiary hospital and the county hospital as two individuals forced to sleep together, strange bedfellows doing the job but with completely different views. "*Tong chuang yi meng*" directly translates as sharing the bed but dreaming different dreams, and it captures the feeling of dissatisfaction and often comedic frustration that arises from this imposed partnership. The lower-tier hospitals believe that if they take on the name of an academic tertiary center, especially one with such a strong reputation as New China Hospital, they will attract more "high quality" (*gao zhiliang*) patients, or patients whose medical needs involve costly and profitable interventions, like cancer patients. This may be the case, but in the initial years of these collaborations, patients often do their diagnostic tests at county hospitals,

and then seek the consulting New China Hospital physician to seek a connection (*guanxi*) to be admitted at New China Hospital. This is an improvement, still, for county hospitals, as the diagnostics tests like CT scans or endoscopies, are profitable procedures which involve very long wait times to have done at New China Hospital. However, the end goal is to keep the patient at the county hospital, and to be able to complete the patient's treatment from diagnostic to treatment all at their institution.

Academic tertiary hospitals hope that by leading the alliance, they will build a broader network of patients who will be more likely to come to their hospital due to their superior reputation, technical abilities, and resources. In conversation with the multiple physicians who told me that building a broader base of patients was the goal of medical alliances, I asked whether this was even necessary. New China Hospital, for example, has over four-thousand beds, and has been forbidden by the government from expanding further (they are, however, circumventing this ban by constructing an entirely new building for "translational" medicine, having successfully argued that patients who are admitted for clinical trials and translational medicine research can be considered separate from clinical patients, and that such expansion is furthering the research goals rather than the clinical goals of the hospital). From my own observations, beds are hard to come by, patients have to wait for weeks or sometimes months to be admitted, and there are always crowds of patients waiting to be seen.

However, Dr. Wu corrects me: "the number of patients waiting for beds has been in significant decline for the past several years… there aren't enough patients for us, and many people feel the pressure of the uncertainty and the precarity. There is a sense of crisis." In the past decades, departments have sub-divided and sub-specialized: for example, what was originally one general surgery department has now become eight different departments, and even what was originally the hepatobiliary division of the department has divided into hepatic surgery, biliary surgery, and pancreatic surgery. Because the patient populations overlap significantly, there is stiff competition between these departments and they often fight over patients. Dr. Wu tells me, "to be quite frank, there are many patients who could either be managed operatively or non-operatively and they always operate because there aren't enough patients and their surgical case numbers would fall otherwise."

Both the academic tertiary hospital and the county hospital believe that they will benefit based on the sole measurement of who does the inevitable surgery. Some believe that the academic tertiary hospitals are losing out, "giving away their knowledge and resources for free." Prior to the start of the medical alliances, these county hospitals were never capable of doing complex surgeries, such as cancer surgeries or re-operations. Even at county hospitals, physicians note that operations that smaller community hospitals previously could not do, they are learning to do, either by sending their physicians to learn from experts at teaching hospitals or by inviting physicians from teaching hospitals through medical alliances or through personal connections to do surgeries at their community hospital. Whether these complex surgeries should be done on a local level rather than at specialized care centers is a complex and nuanced, on-going debate, discussed in a previous chapter. While the imposition of partnership may lead to overall improved efficiency of a regional medical system, what is evident from the conflicting dreams of these strange bedfellows is the ongoing commoditization of the patient. Seeing patients as a limited resource which institutions must fight over is most evident in the policies of inter-facility transfer.

*Transferring up, Transferring down: Commodity Flows*

> If you can do surgery really well that's really impressive and you're probably a great doctor. But with regards to the system, we're just no good. There's no standardization. That's why we're doing everything we're doing now, all of this bidirectional reform. This is the goal of visiting fellowships. And this is the goal of our doctors being sent down [to more rural areas]. But before we get to the point where everyone can reach the same results, then we have to do our best to keep simpler surgeries at the local community level and those surgeries that cannot be done at a local level should be brought up to bigger hospitals.

The policy documents which mandate the implementation of hospital alliances clearly state the importance of public county hospitals as the link between urban and rural healthcare systems. These policy documents describe an ideal case scenario, where for example a patient who needs complex surgery goes to a community health clinic, is rapidly diagnosed and triaged, and taken to a hospital which is capable of performing that surgery. Soon after the surgery is complete, when high levels of nursing care and physician oversight are no longer necessary, the patient is transferred to a lower level of care where he can undergo necessary rehabilitation until his functional status allows him to be transferred home. Any additional wound care, medication administration, or follow-up can be done at a local primary care clinic.

The transferring of patients both up and down is now both regulated and incentivized by national policy and insurance reimbursements. While patients sometimes prefer being transferred to lower-tier hospitals because lower-levels of care which may be closer to home, saving costs, since rural patient family members do not have to continue paying for accommodation and food in a county far from their home, patients are further incentivized to accept being transferred to a lower level of care because they will be reimbursed at a higher ratio by insurance companies. In order to have higher levels of care reimbursed by their medical insurance policies, they must have a certificate from the hospital that indicates that a physician thought it was medically necessary for the patient to be transferred to a higher level of care.

These bureaucratic barriers regulate the flow of patients from hospital to hospital and attempt to decrease the proportion of patients who seek care directly at tertiary academic centers. However, this creates a disparity in access to care: patients who can afford to pay for care out-of-pocket will go directly to academic tertiary hospitals, while patients who cannot afford this are forced to abide by policy guidelines for transfer incentivized through insurance reimbursement. Despite the fact that these reforms have created *more* equitable access, there continue to be loopholes for the rich and powerful.

From the physicians' perspectives, policies and initiatives strongly discourage transferring up and discouraged encourage transferring down. County hospitals are incentivized because the government tracks the number of patients they transfer to a lower-level of care, and if a hospital does not meet these targets, the hospital is often re-evaluated and accredited as a lower-tier hospital, which would cause significant damage to the hospital's reputation and to the income potential of all staff physicians. Additionally, they are also incentivized because discharging a patient increases turnover for limited hospital beds. Patients have the highest cost-per-day during the days immediately prior to, during, and after an operation. The days prior to an operation involve high-cost diagnostic scans and laboratory tests, the operative costs account for the largest proportion of costs, and the days immediately after an operation often involve higher

levels of nursing and scans to ensure successful surgeries. Keeping a patient for many days after the surgery is seen as cost-ineffective, as they are "taking up" a bed that could be used for an incoming surgical patient.

Lower-tier hospital transfer patients upwards in order to minimize risk. Even if the patient requires a surgery that they might feel comfortable doing, if there is anything to indicate that the patient or case would be challenging, in order to avoid that risk, they will transfer the patient to a higher-tier hospital. Lower-tier physicians are aware of the rampant mistrust towards county physicians, which is complex and multi-faceted. Many of the community physicians I interviewed informed me that New China Hospital physicians can practice medicine without the same fears that community hospitals have regarding litigation or retribution. Patients trust New China Hospital and recognize that the physicians there are held to higher standards, regardless of whether they know what those standards are. Perhaps equally importantly, New China Hospital is known for having a strong medical-legal department which mediates all disputes; unlike most other hospitals, complaints are not handled by cash payouts and under-the-table agreements, but require mediation through the administrative department and as this practice has been in place over the past decade, West China physicians are far more rarely bothered by complaints and litigation. As one community physician told me, "if the [same surgical complication] happened at West China, the patient would just assume that this was bound to happen – if even the so-called experts can't cure me, I was always doomed."

While lower-tier hospitals lose income when transferring complex patients, the potential of medical disputes or conflict and subsequent payout is much more significant. County hospital physicians note that most of the patients they admit as transfer patients are older patients who have any risk for general anesthesia, whether cardiovascular or pulmonary. Patients who are difficult to communicate with or who have a history of making complaints against physicians or causing disputes will also be transferred to a higher-tier hospital. Lastly, patients who have highly stigmatized infectious diseases, such as HIV, Hepatitis B or Hepatitis C will often be transferred as individual physicians prefer not to operate on these patients at risk of viral exposure through a needle-stick or other occupational injury while operating. County hospital physicians note that they must accept these patients, no matter how challenging of difficult they might be, because competition between hospitals at the county level is significant. Usually in any given county there are at least two hospital which are of a similar tier, and if they do not accept these challenging patients, their patient numbers will continue to decline, and the hospital would not be able to survive.

Individual physicians are also incentivized to transfer patients for personal and social reasons. One county-level physician describes this as "*li shang wang lai*," which roughly translates as "courtesy demands reciprocity" (or idiomatically, if you scratch my back, I'll scratch yours). As this physician describes:

> If a patient was transferred to me from so-and-so doctor at so-and-so hospital – in a situation where that doctor couldn't do this surgery himself so they transferred the patient up to me? After the surgery, under most circumstances, I'll transfer the patient back to that surgeon because that patient, to me and to the hospital, has provided a financial benefit. So, I should be grateful to him… in recognition of this, I will transfer this patient back to that doctor, and allow this doctor to take care of the patient for the last few steps, even if that management is all stuff we absolutely can take care of at our own hospital. We'll let him do it. These are the

> unwritten rules. … If you don't, maybe next time that physician will transfer a patient to someone else at a competitor hospital.

Though policy happens on a national and institutional level, the implementation of these policies occurs through individual and personal dynamics of debt reciprocity and maintaining a careful balance between institutions and factions. The practice of transferring patients (both transferring up, or to a higher level of care, and transferring down, to a lower level of care) demonstrates the strength of medical alliances when they function in ideal forms, but also the challenges of its implementations.

### ***Dispatch out and upward rises*: *Political Promises***

The New China Hospital physicians who are sent to county hospitals in consulting and advisory roles seem to accept it as part of their job. Though it is a significant additional workload, these "visiting" positions at county hospitals have come to be seen as political stepping stones. Though arduous if political rise is not one's goal, most physicians just accept these stints in the county hospitals as a new addition to their already long list of requirements to make promotion.

Dr. Chao has been involved in the establishment of medical alliances since before the mandate in 2017. One of the earliest collaborative alliances that New China Hospital developed was with a small Tibetan hospital which was run by the local Tibetan government, but located in Valley City. The hospital was to serve the many Tibetan officials who were from Tibet and spoke Tibetan but who were in Valley City for administrative and government roles. When the alliance first began, Dr. Chao was asked to work at that hospital, to help them establish the alliance as their vice president of revenue. At the time, as a junior attending in the general surgery department of New China Hospital, he discussed it with his department chair and with his senior attending and felt that he was in a key stage in his clinical advancement, and leaving his clinical duties would disrupt his surgical training. He felt that in that period of time, becoming an expert in his clinical field was necessary if he wanted to be taken seriously in the future.

Several years later, he was asked to go to one of the alliance hospitals in the advisory capacity, holding weekly clinics and developing their research program. Several years after that, he was told to take a position as Vice President of Operations, a senior management role, at a new alliance hospital several hours south of Valley City. He was informed of this decision and sought me out to have a conversation about it. I asked him whether he had decided to go, and he corrected me:

> It's not whether I decided — the hospital has arranged it. I'm being dispatched. Because before there was another time (referring to the Tibetan hospital) and I turned it down and this is the second time, and this time they called [my senior attending] directly, and he definitely isn't in a position to turn it down for me. When the central government wants to dispatch you, a mere foot soldier, do you really dare not agree?

The term he uses for "dispatch" is usually used with regard to military operations, but it has come to reference a common practice within the Chinese political system where political leaders

are often suddenly told to take up post in another region. This new position is often a challenging one, and the political leader is tasked with solving a significant issue, cleaning up the aftermath of a political scandal, or beginning a difficult reform. Dr. Chao tells me that he does not have a choice; he cannot turn this down. It is a significant opportunity, and if he performs well, he will continue to have good opportunities.

The evening after he finds out he is being dispatched, he experiences chest pain while operating is found to be having a myocardial infarction (a heart attack), and is hospitalized for several days. I visited him in the cardiac ICU, and asked him if this would change his plans. He laughs and tells me that there are no concrete plans in place, but. that they have told him he will be leaving in a few weeks, but he does not know for sure – most of these decisions are out of his control, with little regard for the embodied effects of the stress he is under.

Dr. Wang, one of the younger physicians in the same department says, tongue-in-cheek, that this work of going to serve in the community or at county hospitals is not so different from being sent "down to the village" (*xia xiang,* in reference to the policy of the late 1960s and early 1970s where urban youth were forcibly sent to farming villages). If you could survive this, he told me, there might be opportunity for you on the other side. He makes clear to me that he does not feel that the working conditions are poor – in fact, he says, their facilities are sometimes newer and fancier than the ones that they have at New China Hospital. However, he emphasizes to me that despite occasionally seeing the new hospital buildings seemingly built overnight, there is still extreme disparity with regard to medical infrastructure.

In his capacity as an advisory physician, he has visited several community health centers to conduct surgery on patients who were in critical condition and could not travel the distance to even the county hospital. He describes midway through the surgery, the stirrups which hold the patient's legs during the operation detached from the operating table. He turned to the local doctor, uncertain what to do, and the local surgeon left the operating room and had the patient's family put on a sterile gown and gloves, crouch down and lift up the patient's leg, holding it in position for the rest of the multiple-hour surgery. At another hospital, halfway through the surgery, the overhead OR lights stop working and the patient's family had to rush to go to a supermarket to find a flashlight in order to shine focused light into the cavernous abdomen. He watched my expression as he told these stories, registering my disbelief: "It's hard to imagine that these stories are true when it seems like everywhere you go there is so much investment into the construction of new buildings with new technologies and new equipment. But if you go to more hospitals, you will really see that the investment has been very uneven."

While the conditions of medical care have improved significantly, some physicians truly see being "dispatched" as equivalent to being sent on a humanitarian mission. All who had been dispatched as academic consults at county hospitals described to me how little guidance they received on what they were supposed to accomplish during their three-year stint there. Every week on the same day, at the same time, a driver would appear to pick up a professor on a side street from the main campus of New China Hospital, and after an unpredictably long commute in rush hour traffic, the professor would hold clinic, see patients or round with the team and listen to a research proposal or organize a talk or help consult on a case. Often, they would talk to a few select patients who had more difficult surgical cases, or who needed more emotional coddling. As one community surgeon said, "we make sure that any patient who we think might cause trouble is seen by the West China doctors – they trust them, and they appreciate that we are bringing experts to come see them and go over their cases. Even if the West China doctors

aren't doing anything or have nothing to do with their case, they'll still go see them at their bedside and tell them that the care we are providing is good."

Yidong Gong, in his work on China's ongoing medical aid in African countries, speaks of similar scenarios, where qualified Chinese practitioners often sit idle in African hospitals, limited by language barriers or by patients' unwillingness to be seen by them (Gong 2019). While on the surface this may seem an opposite scenario (in these county hospitals, the West China doctors are certainly being utilized), there is a similar sense of idleness, a sense of biding time, regardless of what is accomplished. Though one may perceive the presence of these physicians in the African continent (or, similarly, in a low-resourced county hospital) as a humanitarian mission (and though the state may frame it in this narrative), physicians who serve in this capacity rarely think of or mention the humanitarian stakes. The stakes are cold: one goes where one is told. The goals of having a New China Hospital doctor present seem ornamental rather than substantial, and some professors sigh in acceptance of their fate when discussing this aspect of their job, making the commute to attend their clinic with a sense of dispassion.

Others seem not to mind, seeing a morning at these hospitals as time off from their normally strenuous and competitive days on the main campus. At their own hospitals, they may feel like just another cog in a very well-oiled machine: the physicians who are "given" these positions are often junior faculty who do not have authority within departments which see changes in leadership too rarely to provide hope to those wishing to climb. At community hospitals, these same junior faculty are seen as demi-gods, bright with halo of the New China Hospital name, their presence heralded throughout the hospital and department. The substantive nature of their work is minimal, but their presence delivers.

For physicians sent to the African continent, to troublesome provinces such as Tibet or Xinjiang, or to a public county hospital, the underlying promise is that if you bide your time, you will be rewarded politically and financially, and if you do well, your opportunities will be substantial. These leadership positions, whether consulting academic chair or vice president, are testing grounds, both for new policies and for new personnel. What succeeds will be brought elsewhere, whether "what" is a novel way of addressing a supply chain or a human being and his charismatic leadership.

For the past three years, New China Hospital has been building a new expansive campus north of Valley City – a state-of-the-art modern facility of all glass and steel, surrounded by manicured campus grounds; this new center will increase the capacity of the hospital by a thousand beds and will be focused on complex care. While they have yet to set a date for its opening, multiple physicians mention that there will be a mass exodus of physicians from the main campus to this new campus, both for clinical duties and to take on administrative and management roles. When new candidates are interviewed for job positions in the department, they are asked whether they would be willing to practice at the new campus. There is only one right answer, and every candidate nods affirmation and verbalizes that they would be honored to be there.

*Gridified worlds: Difference & Distinction in Medical Alliances*

A few months after Dr. Chao begins his stint as Vice President of Yibin No. 1 People's Hospital, one of the West China alliance hospitals, I take a train two hours south to Yibin to visit him. He picks me up at the station at 8am, and tells me I must be tired to have traveled so early. I tell him he shouldn't have come to pick me up, and that I am sure he is very busy. As we walk

around the hospital, few people recognize him, though he is now the third most powerful person in the hospital. "They don't do a very good job publicizing information within the hospital – it's not like New China Hospital, where there are updates on the hospital website and weekly TV dispatches during morning rounds," he tells me. The comparisons are inevitable, given that he is attempting to model this county hospital after New China Hospital. "We're working on it," he says, "there's a lot to do."

In the afternoon, I go to find him in his office; his desk is covered in reports and he tells me the documents are endless. He is one of the most hardworking people I have ever met, and I cannot imagine in this capacity, the stress that he is under to understand as much as he can. He tells me that he is now split between three places – he is still a consultant at Longquan, where he continues to see clinic patients per his contract (and per their advertisement); he spends the majority of the week here in Yibin, overseeing the changes in this hospital as well as the medical collectives in the rural community hospitals; occasionally on weekends he goes home to Valley City to see his family, but usually he must attend meetings and conferences to further his network, or perhaps, more crucially, the network of the hospital he now represents.

As vice president, he oversees all issues of management, human resources, academic research, information sciences, and healthcare reform. Some of these areas are new to him – human resources is a daily headache, trying to keep everyone happy despite significant leadership overhauls – and some areas are more familiar. He's long been interested in the medical reforms and the growth of medical alliances, noting that its easier for him to think about these issues because he's experienced it from all perspectives: "I know what it's like being at that lower rung, and if I didn't experience it myself, maybe I wouldn't be so familiar with which sectors need improvement and what aspects of the proposed systems aren't well designed."

Dr. Chao approaches his management work as a scientist, proposing hypotheses, testing them, and comparing the results to his predictions and expectations. He has been trained to think like a scientist, but even for those lacking formal scientific training, governance has become experimental on many forms. Many have written about China's use of pilot testing for various issues of governance: Shenzhen, especially, is known as a city where local governments test new policies on trade, labor laws, food safety, medical reform [cite]. If a policy seems to work, it may be further tested in other cities, and if it continues to succeed, it may be rolled out on a national level. The birth of medical alliances occurred in this fashion, first rolled out with a single hospital in Shanghai, then Zhejiang, and slowly expanding until adapted for national implementation.

Many of the medical alliances are now being compared to each other in order to determine which types of alliances work best for a particular region or level of care. In each county, there are usually two public county hospitals: often one is a "people's" hospital (Renmin Hospital) and one is a traditional Chinese medicine (TCM) hospital. In Yibin, there are two Renmin hospitals, and instead of directly competing against each other, as they have in the past, the local government has decided to draw a line through the city diagonally, such that the southeast region is under the management of Renmin No. 2 Hospital, and the northwest region is the responsibility of Renmin No. 1 Hospital. This means that any small community medical centers or community hospitals which are within the northwest region have been assigned to Renmin No. 1 Hospital, and Dr. Chao, as vice president, is responsible for building coalitions with them and drawing contracts to bring them into their healthcare collective. As he puts it, "it is as if we have laid out a fishing net over the entire city, and now there are clear grid lines, and

each hospital has put its feet in particular grids and they are now going to administer over that grid. That's the design, at least."

The importance of geographic sovereignty applies beyond these small county grids. The idea of medical alliances is that patients stay within the alliance, and within the greater geographic region. Yibin sits at the southern border of Sichuan Province, bordering Yunnan Province. It is closer for a patient to travel from Yibin to nearby Luzhou, which is at Yunnan's northern border, than it is for patients to travel from Yibin to Valley City. Luzhou houses the Luzou South-West Medical University, the closest academic tertiary hospital to Yibin. Thus, many patients choose to travel across the provincial boundary to go to Luzhou.

The movement of patients across provincial borders means less insurance coverage for the patient, and less payment to the Yibin medical system (and to Sichuan province overall). One of the smaller counties outside of Yibin, with whom Dr. Chao is developing plans for its hospital to join a medical collective, faces this exact problem. One third of their potential medical reimbursements are being lost to the Luzhou area, because patients automatically trust higher-tier (academic) hospitals more than a Renmin or TCM hospital. If New China Hospital comes to Yibin and raises the quality of medical care in Yibin, perhaps these patients would be willing to come to Yibin instead.

These provincial border areas become warzones: major hospitals in all neighboring provinces send physicians in official and less-official capacities to try to establish alliances and friendships in attempt to ensure patients from that area will be brought to the higher-tier hospital of choice. Medical alliances and collectives are the formal form of this relationship-building; consult surgeries, as discussed in the next chapter, are the informal form.

Dr. Chao tells me that the entire goal of healthcare reforms and healthcare alliances is to raise the standard of care such that patients will be willing to stay: "that's why we're doing all of this. To not have patients move around so much, if they trusted their local medical systems, they wouldn't travel for medical care." How to earn that trust is an ongoing conversation: some combination of rankings, reputation, and relationship-building. What these rankings are built on as discussed in prior chapters, has often little to do with clinical care.

He cuts our conversation off, apologizing profusely – the driver has called and he is already late. He has to be driven to a small, community hospital in Jiang'an, which he is going to sign a contract for the hospital to join the medical collective (*yigonti)* with Yibin No. 1 People's hospital. Like Yibin's hospital being renamed West China-Yibin No. 1 Renmin Hospital, this hospital is being renamed Yibin-Jiang'an Hospital. One name nested within another, concentric circles of influence trickling all the way down.

## CHAPTER FIVE: FLYING KNIVES

In September of 2019, a news story about *feidao* surgeries circulated through my social media feed. *Feidao* ("flying knife") traditionally refers to the sport of knife throwing, or to the knife or dagger itself, which was historically favored by assassins and memorialized in the *Wuxia* martial arts novels. In the past few years, this term has come to reference consult surgeries or the itinerant surgeons who perform them. The first character "*fei*" (to fly/flying) refers to the fact that these surgeons get on a plane and fly in order to do a surgery, or that they are rushed from one place to another in order to operate. The second character, "*dao*" (knife), a metonymic reduction of the surgeon to his tool of trade, is again paralleled in the word for surgery itself. Surgery is either referred to as the more formal *shoushu,* literally meaning "the art of a hand," or the more informal *kaidao*, "to open with a knife." Amongst surgeons, these travel cases are referred to as consults (*huizhen*), but in print and social media, these surgeons and this practice are commonly referred to as *feidao* operations.

"*Feidao,*" as a name for these operations, captures the key aspects of the practice: it is about the *movement* and *mobility*[36] of these surgeons (their flights across the country or into different towns) and it is about the *knife* they embody (the ability to cut and to save). These surgeries have taken on the name once given to the tool of assassins rather than armies, the tool of people who operate in the shadows before dark, not quite of the law and not quite against it. It is the tool of individual mercenaries— individuals who operate alone, their services purchased by whomever seeks their temporary allegiance or by anyone who pays an enticing price. Like the mercenaries of *Wuxia* stories, despite their extralegal existence, the operation of these flying (surgical) knives are dictated by norms, which when broken, expose the tenuous and precarious nature of such arrangements.

The news story came out of Shanxi province, in the city of Linfen, where an elderly female patient had suffered a cerebral infarction and required urgent neurosurgical attention. The local doctors at the county hospital felt they lacked the resources and clinical ability to conduct a successful surgery, so the chair of the neurosurgery department drew the patient's daughter aside to recommend she consider a *feidao* surgery: for a 10,000 RMB service fee, an expert from Beijing Tiantan Hospital could fly to Linfen to operate on her mother. All parties agreed that this was the best course of action and arrangements were made for the expert surgeon to fly from Beijing that evening. After successfully completing the surgery, the patient's family handed a red envelope (*hongbao*) containing the 10,000 RMB service fee to the local department chair for him to give the expert surgeon from Beijing. The surgery had gone smoothly and the patient was recovering well. The visiting surgeon received the payment and returned to Beijing not long after operating. The patient would continue her post-operative recovery at the local hospital, under the watch of the local surgeons.

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[36] This conversation on mobility draws from the work of other medical anthropologists who have written on clinical mobility or the mobility of patients or research subjects through clinical spaces. Petryna, in describing the scientific, economic, and regulatory mechanisms that dictate the movement of clinical trials to low and middle-income countries, argues that the movement and restructuring of global research and the uncertainty of potential change leaves research subjects unprotected to new forms of harm (Petryna 2007). The exploration of this chapter of the work necessary to make mobile draws also on the work of Lawrence Cohen, who writes on the importance of mobility in the extraction of "biovalue" of patients and organs as well as the assemblages and shifts necessary to make such extraction possible (Cohen 2005; Scheper-Hughes and Wacquant 2003).

However, a few days later, a cell-phone video was leaked to media outlets with the title "Doctor Privately Accepts 10,000 RMB *hongbao* from Patient": the patient's family had secretly recorded the passing of money between hands, and lodged a formal complaint and initiated legal action against both the county hospital and the Beijing expert. The department chair was suspended from his position, and the county Ministry of Health opened an investigation.

This news story spurred spirited debate online and amidst my colleagues, revealing the entanglements of markets and morals within which *feidao* surgeons operate. Consult surgeries are technically an illegal practice. If this were not so, there would be no case to investigate and no complaint to lodge – though most media outlets claimed that the incident was reported because of the *hongbao* and not because it was a *feidao* surgery. Many practices in China exist in legal gray zones and many such "technically illegal" practices are accepted so long as they operate within established norms of behavior and morality. One of my friends in China once described China's legal system to me by saying: "Just because there is not a law saying something is illegal does not mean that it is legal. Just because there is a law saying that something is illegal does not mean that anyone is paying attention to the law. Even if they are paying attention to the law, it does not mean they will take it seriously." There are certainly offenses which are certain to result in punishment, but everything seemed to come in waves – waves of anti-corruption arrests were particularly popular that summer.

Regardless of the legality or the outcome of the suspension, the debates around this news story were heated. *Feidao* surgeons were referred to as "wealth collectors" or "black hearted" for charging high fees that desperate patients feel obliged to pay. Other netizens lambasted the patient's family, calling them snitches with no moral code. "What sort of person registers a complaint against the person who saved their own mother?" Moral camps formed, with each side cursing the other. "For all of you [commenters] defending the family, I hope you and your family fall critically ill and no physician is willing to come and save you."

Some netizens pointed out that by reporting this surgery as corruption due to the *hongbao*, this family was not only breaking a moral code, but also discouraging physicians from practicing *feidao* surgery: "what if I need surgery and now no surgeon will come help me because they are afraid of people like you?"[37]

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This chapter examines *feidao* surgeries as a practice which arises from previously discussed medical reforms. Expert surgeons have traveled to do consult surgeries for several generations, but it seems anecdotally that in the past ten years, this practice proliferated significantly. Recent healthcare reforms resulted in expanded insurance coverage, which provides individuals with increased access to tertiary care which was previously not available or affordable. Simultaneously, an economic boom brought about a growing middle class who not only can *afford* healthcare services but also advocate for better care, with willingness to pay cash for access to the best. At the same time, there have been changes in employment regulations which allowed surgeons to hold licenses to operate at multiple hospitals, making such practices

[37] The role of netizens and other forms of public commentary on the morality and ethical expectation for physicians has shaped public discourse about patient physician distrust (*yihuan guanxi*). While this chapter does not engage substantially with this, it is worth observing that the profession of medicine, more so than other professions, has become a site of moral criticism. Some have argued that critiques levied at physicians provides an opening or scapegoat for other political and social dissatisfaction which are not available sites for moral or ethical engagement (Tu 2014).

technically legal[38]. However, the growth of consult surgeries relies also on a complex and intricate network of surgeons, hospitals, and markets, and the practice of consult surgeries represents a peri-legal grassroots response to inequities of access in the Chinese healthcare system.

*Feidao* surgeries also exemplify the transformation of China's medical system over past decades which result from shifting national priorities. As explored in Chapter Four, China's state government has encouraged domestic innovation in biomedical research and focused funding expenditure on tertiary medical systems, specifically county third-tier hospitals. These priorities within the fields of medical science reflect the role that science, technology, and medicine play in China's narrative of historic weakness or defeat and modern revival. In *Can Science and Technology Save China?* Greenhalgh and Zhang (2020) assert that "Chinese science" is distinctly *Chinese* because of the presence of prominent market logics as well as China's "subordinate position in the global hierarchy of science" (12).

Whether China remains in a "subordinate position" in a so-called "global hierarchy" may be up for debate, as discussed in previous chapters, the presence of an imagined hierarchy shapes the ambitions of Chinese scientists, doctors, innovators, and government officials. Though Greenhalgh, Zhang, Song, Mason and others propose that Chinese scientists seek to "catch up" to international or "Western" ideals of scientific productivity and innovation, I assert in previous chapters that this desire co-exists with assertions of superiority in training, data-collection, and advances in healthcare systems. This desire to prove Chinese distinction exists within historical trends of globalization and interconnectedness, as Chinese scientists and physicians strive to be accepted and respected within international academic communities, as discussed in Chapter Three.

However, globalization and the interconnectedness of scientific, academic, and medical communities continues to shape surgical practice in China, so too does an alternative trend of increasing localization and decoupling. While discussion of decoupling focused on the economic relationship between the U.S and China and escalated with tariffs, regulations and the "Trade Wars" in May of 2019, examination of the economic impact of breaking ties between China and the US revealed technological dependencies: a trade war and a technology war seem inseparable. Thus certain Chinese intellectuals and state actors have pushed for independent innovation (especially in the science, medicine, and technology sectors) which do not rely on the good will or open trade-relations with the U.S. and other countries.

While the 2019 Trade Wars heightened this conversation, conversations around the importance of localization and decoupling had already existed for decades. Researchers, physicians, and policy makers seek solutions to problems or challenges in China's medical system (whether biological and disease-oriented or administrative and structural) in an attempt to diminish reliance on foreign and international experts, recognizing that many challenges can (and perhaps should) be uniquely addressed on their own. Department chairs and hospital administrators explained to me that solutions that work for other countries may not work for China: that they are faced with unique challenges with a very large population and uneven development and resource allocation. *Feidao* surgeries are one such example of this problem

[38] In the past decade, employment contracts at hospitals were loosened, allowing for surgeons to take consultations at other hospitals. There are formal channels through which these consultations occur and paperwork that is signed by both hospital administrations. The community hospital pays the consulting hospital a nominal fee (usually around 200 RMB), and the hospital then gives 60-70% of that small fee to the doctor who takes the consultation.

solving: an attempt to address inequitable medical access, to (temporarily) re-distribute medical talent throughout a country with unevenly distributed healthcare resources.[39]

In the past, the uneven distribution of healthcare resources has resulted in the migration of patients from community hospitals to urban tertiary medical centers. Even if patients do not go to large hospitals on their own, any complexity in their case prompts community hospitals to transfer patients to academic hospitals, not wanting to take on the risk of keeping critically ill patients who will negatively impact their numbers for length of hospital stay or mortality rates. However, the movement of patients creates a vicious cycle: as complex patients are almost exclusively seen at top hospitals, community hospitals have minimal experience with the management of critically ill patients, and are therefore more likely to make errors in diagnosis or management, which are often then publicized via sensationalist stories of medical errors. This feedback loop leads to perpetuated mistrust by patients[40] of community doctors and an insistence on seeking assumed expert physicians who practice at large, academic tertiary hospitals like New China Hospital. However, patients with complex care also have costly care; the movement of complex patients from community hospitals to urban academic hospitals also represents the "erosion" (*liushi*) of patients for community hospitals and loss of income from their (costly) complex care.

*Feidao* surgeries counter a problem (the movement of patients) with a solution (the movement of surgeons). Community hospitals wish to provide expert care, but know they do not have the training to do so: now, if there is a complex operation that a patient requires but which a community surgeon does not feel comfortable performing, the community hospital can send a consult request to ask for an expert from a tertiary hospital: for such a service, the patient must be willing to pay a bonus directly to the expert surgeon. How did *feidao* surgeons come to be mobile? This chapter considers the individualization of the surgeon, the building of standardized hospital systems and operating rooms, and the moral norms that allow for the movement of surgeons through these hospital systems.

I propose that *feidao* surgeries are akin to domestic humanitarianism, the mobilization of surgeons and their technical expertise within *moral* and service-oriented narratives. While *feidao* surgeries undoubtedly can be seen as the capitalization of market models of care in post-socialist China, I argue that this phenomenon must also be understood within the context of moral service: for patients, for surgeons themselves, and for the medical system at large.

### *Market Morals*

*Feidao* surgeries operate within an entanglement of moral codes and market politics, where the matter of cost is at the forefront of considerations. China's shift to a market-based economy after Deng Xiaoping's "Reform and Opening Up" period made healthcare an individually purchased commodity and a series of purchasable services (diagnostics, drugs, medical services, etc.) from individual providers or hospitals, in contrast to the rural communes and cooperative medical system which had provided limited health services through the 1980s.

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[39] As discussed in previous chapters, medical resources and medical talent are unevenly distributed throughout the nation, siloed in urban centers, such as Beijing, Shanghai, Guangzhou, and Shenzhen (the so-called "first-tier" cities). New China Hospital is an exception to this, as it is located in a second-tier provincial capital, yet has continuously ranked second in national hospital rankings for the past decade.

[40] This mistrust which has resulted in violence against physicians has been written about extensively by the author and others (Xu W 2014, Tucker JD et al. 2015, Chan CS 2016, Nie JB et al. 2018)

Early models of health reform which decentralized and expanded medical care while limiting government expenditure resulted in an expansion of medical entrepreneurialism and the pursuit of alternative methods of income-generation by healthcare professionals (Song 2017).

The market nature of healthcare is evident in netizens' critiques of this Linfen family. Most netizens recognize that healthcare resources are unevenly distributed throughout the country, and that the option to seek *quality* healthcare in Linfen did not exist, compelling the family to seek a *feidao* operation. The healthcare disparities discussed in the previous chapter are the root of *feidao* practices, which allow patients who live far from higher-tier hospitals to access medical care by expert physicians.

While the 10,000 RMB service fee is indeed high for the majority of the population (the average income in China is approximately 5,000 RMB a month), this cost was, in the opinion of many online commenters "fair" because to receive for an equivalent level of service would be so much more expensive. One article, which was posted by many of my medical colleagues in my WeChat circles, made the following argument:

> Even if she and her children had arrived in Beijing for medical care, it would be difficult to get an appointment. They would probably only be able to get an appointment from a scalper, and it would be up to chance (or karma!) whether or not they ended up seeing a good doctor. This trip alone for the entire family would cost at least 10,000 RMB, and most likely they would end up spending multiples of that and would have much worse results.

Based solely on a cost comparison for an equivalent surgery by this expert surgeon, the patient would spend much more in travel fees and hospital admission costs. Additionally, by asking an expert surgeon to travel to them, the patient remained at a community hospital rather than traveling to Beijing, and was therefore able to bill their insurance for reimbursement of the cost of the hospital admission, since insurance policies incentivize remaining at local hospitals. But perhaps the crucial point made by most commenters is that this patient would otherwise never even have the opportunity to be operated on by this expert surgeon: "*it would be up to chance (or karma)*" as to whether or not they found a good surgeon and had a successful operation.

The unequal distribution of medical care is not just a concentration of resources and hospitals in major cities: it is a concentration of *talent*, which matters more so in a healthcare system where abilities and quality of medical services are acknowledged to be grossly variable. As discussed in the previous chapter, the principle of "equity" is increasingly cited in conversations about healthcare reform, market prices account for this moral component of creating a more equitable healthcare system.

The narrative of morality around addressing the inequity of resource and access in the medical system occurs on a global stage. Humanitarian medical travel allows non-fee-paying patients to receive care, whether it is the patient or provider who travels for the surgery. While the practices of humanitarian medicine are not without critique, "heroic" medical professionals from resource-rich countries continue to fly to resource-poor settings to provide surgery (cataract surgery, fistula repairs, and cleft-lip surgeries are particularly popular), and funds are raised to fly in carefully selected patients (especially children) to "global centers of excellence" for life-saving surgeries (Whittaker, Manderson and Cartwright 2010). Certain patients are considered worthy of medical intervention and those who are willing to gift their services and time, given

significant lost income potential, are lauded for their morality and their contribution towards making high-quality services more accessible to more patients.

Despite accepting significant cash bonuses, *feidao* surgeons are therefore considered (by themselves, and by others) to be doing a moral service by traveling to these county hospitals to provide higher-quality medical services. One news article about the Linfen incident wrote:

> The ability to bring high quality health resources and abilities via this unusual method of feidao operations is really just a covert way of doing good. In our current society, the cost of all commodities is soaring higher and higher — in any region, to charge 10,000 RMB can be considered an act of moral consciousness and kindness.

The writer implies that the physician is charging "only" 10,000 when he could ask whatever he wants for his service in this rural area to a patient and her family who are desperate for his intervention. The fact that the fee is *not higher* is itself part of the moral narrative of "doing good," thus the market price and the morality of the operation are intricately intertwined.

The inseparability of morality from expert technical service provided and the subsequent high fee is not always the case in surgical operations. Plemons (2017) writes that surgeons capitalize both on their compassion and on their skill; for example, surgeons who specialize in facial feminization surgery (FFS) emphasize their *goodness* rather than their technical ability. Though the FFS is technically demanding, what separates FFS surgeons from other plastic surgeons who may do similarly complex surgical procedures is that FFS surgeries drastically benefit the patients, and that these surgeons take great pride in the compassion and beneficence shown towards an often marginalized, stigmatized, and suffering trans community. Plemons, who conducted his fieldwork in an American surgical clinic, additionally highlights the separation between the surgeon's role as a compassionate individual from the surgeon's acceptance of payment for his services and the financial cost of surgery. In surgical suites, surgeons exclusively spoke to patients about medical care, while front-office assistants spoke to patients about costs and payment plans. Surgeons never spoke of cost or handled payment, focusing only on the technical and compassionate aspects of care.

In my own experience in American academic hospitals, there is an avoidance of the "dirtiness" of money: surgeons rarely discuss cost of a surgery during conversations with the patient while weighing the risks and benefits. Informed consent conversations discuss *medical risk*, post-operative infections, surgical complications, or death, but do not discuss financial cost or loss of employment from potential disability. There is a sense that money should not be part of the consideration, that front office receptionists and insurance companies deal with cost, while physicians and surgeons are there to heal. When patients ask about cost, surgeons often defer to others, telling them that someone from the office will discuss this with them. Patient finances are not part of their concern, and it is clear that they think it should not be part of the consideration. *You need this surgery*, they'll often say. Implying, *it doesn't matter how much it costs*.

In fact, the academic surgeons in American often do not know how much a surgery costs – when I ask, they often say "it depends on the insurance" or "it doesn't work that way." While surgical techs and scrub nurses may know the cost of individual sutures or equipment, physicians only know if they have been repeatedly chastised by hospital leadership for wasting equipment (opening equipment during a surgery that they do not end up using). Their incomes are not based

on the cost of individual surgeries and as long as they reach certain quotas, their salary does not change. In contrast, every surgeon I interacted with in China knew the exact amount they charged for every operation. Informed consent conversations were forthright about the cost of the operation, including what aspects of costs were negotiable and which aspects were not. When considering the risks and benefits of the operations, some surgeons explicitly told the patients to consider the cost of the operation and the impact this would have on the family (especially if there was a high risk of morbidity or mortality after the surgery. I once heard a surgeon ask the family during an informed consent conversation: "would the financial cost be worth it? Would that financial burden on your children be something you felt comfortable with?." The cost of surgery and the financial compensation for the technical and material components of surgery were foregrounded in decisions about whether to undergo an operation.

*Feidao* operations couple technical skill and compensation, an entanglement of a surgeon's goodness (both moral and technical) and his associated fee. The price of a *feidao* operation fluctuates based on moral imperative, as well as a number of other factors, which reveal additional incentives at play. When I asked about pricing models and who determined compensation for *feidao* operations, one of my close friends and interlocuters, a neurosurgeon and Associate Professor at New China Hospital who spent most of his weekends traveling to conduct *feidao* surgeries, told me:

> But you might ask less if you're a younger doctor and more as you get more senior; you might be willing to do it for less if it is a patient who is lower socioeconomic class and really cannot afford it, or you might be willing to ask for less if it is a rare case that you would want to do anyway as you might be able to write it into a case report or use it for a conference presentation. You might ask more if the hospital is farther away and less convenient for you — there are so many factors and it can be quite arbitrary. It also depends on the "market price" – what other people are asking – which can also change.

Fees are paid directly to the visiting expert surgeon, a thick envelope holding a large stack of one-hundred RMB bills pressed into hands or stuffed into the pocket of the surgeon by grateful family members. Occasionally, when the sum is particularly large, stacks of bills are held together by rubber bands, and multiple stacks are wrapped in old newspaper, an awkward and conspicuous bundle that is hastily shoved into the surgeon's backpack or messenger bag. The materiality of the cash[41] itself is important in its visual and tactile representation; though WeChat pay is used ubiquitously throughout Chinese society, from rent payments to fruit vendors, cash payments are the norm in hospitals. WeChat pay can be easily tracked, proof of electronic transfer between two individuals recorded in perpetuity. The red envelopes or bank envelopes which contain stacks of cash are triply anonymous: unclear who handed it over, unclear who ultimately pockets it, and unclear what amount the envelope contains.

The bundles of cash haunt these stories and the memories of the surgeons. Two surgeons told me separate stories about turning down cash payments; for both, the material heft of the cash imprinted on their minds. One surgeon declined additional payment after completing an operation for which a fee has already been paid. He described the patient's brother following him

[41] There is extensive anthropological discussion on the materiality of cash, the cultural restrictions on monetary circulation, and the dirtiness of money which limits the circulation of the abstract ideal of currency as a material object (Arno 2005, Maurer 2005, High 2013).

in the well-lit hallway of the patient ward with the red envelope, thick with cash, prominent in his hands. Amidst the busy corridor filled with the watchful eyes of his colleagues as well as the ever-present security cameras mounted high throughout the halls, the surgeon felt he could not accept the envelope, and pushed it away, a little too hastily, such that the envelope fell to the floor. "*The sound of that thud! It fell to the floor with such a sound, I knew there must be so much money stuffed into that envelope. Everyone turned to stare and the patient's brother picked it up quickly. I could hear that thud ringing in my ears for so many days after."*

Cash becomes counted by senses: the visual addition of bundles of cash, the sound of a heavy envelope, or the flicking through of many bills, the smell of the old newspaper that is used to carry large quantities of money. Another surgeon described being handed a large pile of money, and taking only a few of the bundles:

> I was new to [doing consult surgeries], and I didn't know what a thousand RMB looked like in bundles of cash, so I thought I was taking a lot, and I knew they were very poor, and just seeing that pile of cash like that wrapped in newspaper, I couldn't bear to take it all. But I am so stupid – I implored the chair return the cash to the patient, but there is no way that he did. I kept thinking about that pile for so many weeks afterwards. I could really use that money, and I know it didn't go back to the patient.

This surgeon faulted himself for not recognizing the material value of the money in front of him, failing to translate the visual bundles into monetary amounts. But he also faulted himself for not recognizing that if he did not take the cash, someone else would. Just as surgical trainees learn to embody surgical practice in the operating room – recognizing and learning from patterns of sounds, or back aches and arm soreness from retraction – the sensorial embodiment of being a *feidao* surgeon includes learning to feel, hear, intuit and engage with the cash fee.

None of the doctors who I observed accepting *feidao* fees or who described accepting these fees ever counted the money at the time of receipt. To do so would be considered a social faux pas, an indication that the money was the incentive, or that the amount could possibly be not enough. The money was always anonymized – no notes, memos, contracts, or paperwork was included. Doctors always stuffed the money into their pockets or bags while blushing, and would take out the envelopes in the car or after the patient or family member left their office to quietly count the bills, fanning them and ruffling them between their fingers. I always glanced away; it seemed equally a faux pas for me to look. Already witness to a seemingly private scene, I never asked about monetary amounts, letting the sound and visual of the money speak for itself.

***Domestic humanitarianism***

I found it strange that while discussions of money (income, cost or rent, real estate prices) were common topics of everyday conversation amongst friends and colleagues, the surgeons who did *feidao* operations rarely spoke about remuneration. Despite the known financial incentives, these surgeons were often lauded by their friends for their willingness to go to these rural places, to travel so far during their off hours to provide their services and talents to others; the focus is on their *service* (as in, an act of helping), rather than on the financial compensation. For some physicians, it seemed as if each surgery was like a mini medical mission, with the remuneration seen as covering the cost of travel, or as a payment of gratitude for a successful

operation. Their motivation was to provide help to those who cannot otherwise receive specialized care, rather than to make money, though the money certainly sweetened the deal.

These surgeons told stories of occasional patients who truly could not afford the surgery and left without paying after the surgery. They may not have accepted the surgery had they known they would not be paid, but these surgeons were not angry when confronted with a patient who truly could not afford to pay. Their response was only to ask for more careful vetting in future cases. Often surgeons emphasized the emergent nature of these surgeries: these cases often required urgent attention at risk of perforation, bleed, or worsening infection. One surgeon, when chastised for traveling late at night after a dinner gathering to perform a *feidao* surgery, said "*I was supposed to go do the surgery a few days ago, but something came up. The patient truly cannot wait any longer, it would be too dangerous. I have to go now. If I don't go, who would do it? What will happen to the patient?*" There is a sense of individualistic heroism: a sense that this surgeon alone can do this surgery. The payment is therefore secondary.

At the core of all of this is a sense of morality that feels lost in their everyday practice of surgery. Many of the surgeons react in surprise when those outside of medicine exclaim that they are saving lives, noting that this is just their job and what they are trained to do. It is one of the major differences they note between their practice in China and their experiences abroad[42]. Multiple surgeons told me a similar anecdote: that when the customs official asked them their occupation, and they responded "I am a surgeon", they were shocked at the responses of respect for the profession of medicine from a member of the civil service. Others told similar anecdote about being asked by cashiers at grocery stores or taxi drivers, and how surprised they were to have the admiration or respect from strangers.

They expressed that they rarely receive this sense of respect from people in China, and amidst an ongoing crisis of societal mistrust towards physicians, many Chinese doctors regret having entered this field and would discourage their own children from entering this field. They told me that in interacting with American or European researchers, doctors, or lay people, they found that the moral good seemed to be so emphasized in American or European medical training and told me that it rarely or never emphasized here in China. I found it interesting that in the same way that the surgeons who do *feidao* surgeries say that doing these surgeries restores (or at least replenishes) a sense of meaning to their surgical practice: their narratives mirror that of my American colleagues who volunteer with organizations like Doctors Without Borders or Mercy Ships during their time off, to give meaning to their otherwise banal work that begins to lose meaning with each repetitive operation or shift.

For Chinese surgeons, the sense of being needed and of respect for the moral calling of their work emerges in consult surgeries in a way that rarely exists in their everyday practice. Surgeons describe their normal employment as being a foot-soldier amidst many, a cog in a machine. One surgeon told me that the narrative amidst the community is that service is expected of doctors: the oft-repeated Maoism "serve the people" (*wei renmin fuwu*) has come to imply for doctors that their service is expected and need not be compensated. With *feidao* operations, each surgeon is the hero of his own narrative, in the eyes of the community doctors and of the patient. The ability to parachute in and make a positive difference provides all of the positive experiences of surgery without any of the mundane tasks of seeing pre-operative patients in clinic, screening

[42] All West China professors must spend at least one year abroad doing either a research fellowship or a clinical fellowship. Many choose to attend American or European institutions, to ensure that their English abilities are adequate for future research collaborations and to build connections with preeminent international research institutions

for appropriate surgical candidates, signing paperwork and writing progress notes, or hassling family members through admission and discharge.

### *Individualization as a prerequisite for mobilization*

*Feidao* surgeons are sometimes the best in their field, but sometimes they are not. The narrative of *feidao* frames these surgeries as solo operations where in being solo they are automatically elevated. The sentence, "*If I didn't go, who would do it?*" is uttered often, focusing the importance on the "I." The subject of this mission becomes the surgeon, not the patient or surgery, who is merely the vessel through which he displays his prowess and reaches another level of achievement. Perhaps another surgeon from New China Hospital could do the consult, but it is never phrased this way. Most community hospitals liaise with one or two surgeons who might be willing to do a consult surgery; there is no public database of *feidao* surgeons one can draw from and surgeons are not easily reached. At New China Hospital, the young faculty-level surgeons who do *feidao* surgeries might not be considered talented or particularly good at operating; they are small fish in a very large pond.

In contrast to their everyday work environments, consult surgeries emphasize the individualization of the surgeon himself (for surgeons are almost always male), the importance of each particular surgeon and his particular skill set and expertise, which makes him valued, desired, and worthy of invitation. It is enough that the West China surgeon can do a surgery that the local community surgeon cannot: it does not matter that he is not the best at this surgery, or that compared to another New China Hospital surgeon, he is inferior. Success is meaningless when surrounded by other success, expertise is dulled by the presence of other experts: relationships are defined by comparison. West China surgeons are able to market their individuality and individual ability only outside of the context which gives them their value.

Consult surgeries and the mobilization of surgeons rely on the *individualism* of surgery in China. This may seem counter-intuitive, as a minimum of three people is needed to perform any given surgery: an anesthetist, a surgical assistant or tech (often a nurse trained in the operating room, referred to as a "scrub" nurse), and the primary surgeon. However, in addition to requisite nursing and anesthesiology support, surgeons usually operate in teams[43]. Operating in teams allows the primary surgeon to move faster, as assistants provide retraction and improve visibility and access for the surgeon. At an academic training institution like West China, operating in teams also provides trainees with opportunities to gain hands-on experience in the operating room. Familiarity with team members allows for more efficient and successful surgeries; after several times operating with the same surgeon, trainees learn to recognize what instruments the primary surgeon will want for which tasks, and the preferred order for the steps of the operation, as well as idiosyncrasies regarding how an instrument is held or how an organ is retracted aside.

At West China and at many academic tertiary hospitals, fellows and residents rotate between different departments, staying a month in one department before leaving for another. In just a few short weeks, it is often rare for camaraderie to develop or for individuals to become familiar with each other's habits and quirks. Surgeons at West China also interact minimally

[43] Most laparoscopic cases have two surgical trainees (fellows or residents) in addition to the primary surgeon (the attending surgeon) — one to hold the camera, and one to assist laparoscopically — and open cases often have up to three additional trainees assisting with the case and often more are present to observe and learn. Occasionally on a particularly difficult case, another professor of equal or more senior standing will "assist" on the case in lieu of a trainee.

with anesthesiologists and scrub techs, taking pride in their ability to work with anyone and under any circumstance. Therefore, surgeons at top academic training hospitals (like West China) do not feel that they need "their team" in order to operate: they are capable and willing to operate on their own. While it is, of course, preferable to operate with someone familiar, and surgeons enjoy operating with their colleagues or close mentees to have friendly and familiar conversation while operating, the *ability* to operate with anyone is crucial to the mobility of surgeons and their ability to do consult surgeries. Thus, despite the appearance of a surgical *team*, the success of a surgery is credited to a single individual.

I asked one surgeon whether he ever worried that his surgery would be less successful at an unfamiliar hospital. He laughed at me, and said:

> "The thing is, we're not that supported in our own hospital to begin with. It's not as if our nurses are particularly helpful. In contrast, when I'm a visitor at a hospital doing a consult surgery, they will often give me their best scrub nurses and circulators and an experienced anesthesiologist and make sure that the operating room is well equipped. They want me to succeed and they want to observe what is otherwise a routine surgery at West China."

Surgeons are seen as individual actors who can operate given just the bare essentials: an operating room, regardless the quality of the instruments, and a team of ancillary staff, regardless of the quality of the staff's training.

Though perhaps ideally, the surgeon would have the best possible instruments and the best possible staff, trust is placed in a single surgeon because of his individual training and expertise – no patient asks about the expertise of the anesthesiologist or the manufacturer of the gastrointestinal anastomosis stapler. The success of the surgery is assumed to be tied to the quality of the surgeon. Consult surgeries are accomplished by a singular individual: it is this assumed sense of *individualism* which lends surgeons their mobility and ability to operate anywhere. Though surgeons often check back in with the community hospital to ensure that the surgery has gone smoothly, the surgeon rarely returns to check on the patient in person, relying instead on the community surgeons to relay concerning symptoms during the post-operative recovery period. Even if there are concerning symptoms, however, patients assume that given the West China surgeon's expertise, if there are complications, even with the best doctors, the patient was probably doomed, and it is still seen as a best-case scenario.

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During my time at West China, I heard often of these consult surgeries, and while on service with one particular surgeon, Yang, he made clear that his evident exhaustion was partly because his operative days were packed with long cases, but more because his non-operative days were packed with consult surgeries. I mentioned to him that I wanted the chance to visit other hospitals, and he promised to bring me along one day. He told me that there was a hospital in particular he wanted to bring me to. I thought, at first, that there would be something special about the hospital or the physicians there, but eventually, he told me that the hospital is in a town famous for their fish, and he said it would be worth it for me to join him on a surgery there. Many weeks later, when I thought he had long forgotten, he stopped me just after a surgery. *Text me your address*, he says. *We're going to eat fish on Sunday.*

On Sunday, at 7:15 am, a black SUV pulled up to the curb outside my building. Yang sat in the front passenger seat and greeted me with a brief smile. After asking if I had breakfast, Yang fell back into silence as he tapped away at his mobile phone. I was fidgety, wondering if his silence was indicative of irritation; perhaps he regretted allowing me come. More likely, of course, was that given the early hour, he was tired. From his WeChat posts, I knew he had only just come back from a conference he helped organize, rushing back to make this surgery.

We soon pulled off the highway, entering a town forty kilometers southwest of the city; the avenues and intersections were comically wide, and the lands flanking the large avenues were desolate with an occasional rundown building amidst weedy growth or the beginnings of construction on hastily cleared land. Large banner signs with socialist block letters declared the strength and prosperity of a growing city, though this small city felt like it had yet to be built. Yang excitedly told me that the river fish here is delicious: the fish seemed to be the reason he brought me on this specific trip. I realized that he goes to so many places to do so many surgeries, he has come to differentiate the towns by the meals he eats, and occasionally takes on cases which allow him to return to a particularly tasty location. In this weedy town, it is the fish.

Yang is one of the many surgeons who augment their official income with these consult surgeries, who sacrifice sleep and time with their families, traveling after work and on weekends to operate at other hospitals. The financial incentive is obvious, as the bonus is paid in cash (and is therefore not taxable) and substantive, at times up to half of a surgeon's monthly income for a single surgical operation. However, other incentives exist as well, including the establishment of reputation and networks of influence which may lead to further professional and financial opportunities. Surgeons see it as a way to make a name for themselves, and to build their experience and increase their case numbers for complex surgeries. The more a surgeon travels, the more his name is the one which comes up when someone needs a surgeon; patients mention to fellow patients that this is an option: "You can ask for a West China surgeon to come do your surgery, you know! You can't get any better than that." They would often give a specific name or a cellphone number that the patient could call: "this is the surgeon who operated on me. Yang. I really trust him." Each consult surgery is therefore a mobilization of a surgeon's name, body, reputation, connections, and networks, all made more mobile with each iterative travel. Many younger surgeons, as soon as they have the qualifications and the reputation to begin to do consult surgeries, will go every day, to nearby hospitals after work, and driving two to three hours each way to farther cities to do consult surgeries on the weekends, to establish their name and to establish their network.

Consult surgeries are an extension of the bustling gig economy in modern China, where, via a multitude of mobile applications, one can order any number of services or goods to your door, and thousands of young men and women speed through the streets on color-coordinated scooters to make such deliveries possible[44]. These surgeons are an exemplification and result of China's growing middle class which has risen from poverty and seeks to rise still, willing to sacrifice their sleep, health, and personal relationships in that rise. These after-hour and weekend

[44] Of course, there are significant differences between surgeons (who have secure primary employment and income) and the precarity of gig economy workers: however, the necessity of mobility and speed, the transaction-based fee-for-service model, and the on-demand matching of individual (idle) workers with value-seeking customers (Vallas and Schor, 2020). The hybrid traditional-employment-cum-gig-labor of the consult surgeon is unusual both in its composite state and in that the gig labor relies on the existence of primary employment, much like a teacher who tutors on weekends.

surgeries move surgeons around the city, province, and even country, by car or train or plane; surgeons made durable objects of science and expertise, ready to be of service at any hospital. But what allows surgeons this mobility, and what motivates their move?

### *Familiar Worlds*

Hospitals are being constructed and rebuilt all over the country, old structures torn down and sprouting up anew within a year, gleaming buildings with reflective linoleum tiles and sun-filled atriums and oversized LED screens depicting wait times and remaining available appointments. At newer hospitals, an information desk by the entrance sits reminiscent of the concierge desk at a five-star hotel, a reflection of an increasingly consumer-oriented healthcare delivery model (Sloane 1994). Often, just behind a newly built hospital building, construction crews and orange cranes break ground on an additional inpatient building or laboratory for translational science. Each of these buildings costs several billions in government investment, and it always surprises me that everyone knows the exact cost of new construction.

The community hospital where Yang brought me appeared newly renovated, though it was obviously small and quite empty. Compared to the throngs of patients and patient families which traffic through New China Hospital every day, assembling as long lines at all elevators and kiosks, only a few individuals sat in the atrium of this hospital and milled about the central nursing station. Even on weekends, New China Hospital is reminiscent of a busy transport hub, and this community hospital, in comparison, reminded me of an empty train platform. We took the elevator up to the general surgery inpatient floor, which shares a floor with gastroenterology. Yang had clearly been to this hospital before and located the workroom easily, sitting down at a computer and scrolling through the CT imaging of the patient to be operated on, When the chair of the department joined us, we walked up to the operating suites; the chair handed me a pair of scrubs, cap, and mask as Yang grabbed his own. Though I had never been to this hospital, the walk from changing rooms past double doors and scrub sinks felt familiar; the architecture of every operating suite embodying the same logics of sterility and ease of patient transport.

In the operating room, Yang introduced me to the young surgeon, Li, who would assist him on the case. Li completed his requisite one-year visiting fellowship at New China Hospital a few years ago, and spent six months on Yang's operating team. Li was one of Yang's favorites when he was a visiting fellow, famed amidst his peers for his ability to hold the laparoscopic camera steadily for hours on end. Now that he had returned to his job here, he had recently won an award for promising young surgeons, and Yang teased him for this news, which was evidently broadcasted quite extensively on the official hospital WeChat and amongst their circle of friends. When the surgery began, Yang was clearly at ease operating with Li: though time had passed since Li's fellowship, Li was still familiar with Yang's habits and preferences.

The operating room itself was newer and larger than the operating rooms at West China which are small, crammed with equipment, sporting floors stained with various bodily fluids. There were a few differences in equipment: the laparoscopic atraumatic graspers did not lock, so the assisting surgeon had to keep adjusting his grip and even still, the omentum continued to slip out from between the instrument's teeth. The gastrointestinal anastomosis (GIA) stapler was made in China rather than by Johnson & Johnson, the preferred international brand at New China Hospital, and Yang mentioned to Li that he should be on the lookout for an anastomotic leak in case the staple line made by the domestic-made GIA did not hold. A few of his usual gadgets were not present at this hospital, and Yang made do with what was available. He did not need to

pause to troubleshoot; before he began the surgery, he glanced at the sterile instruments laid out on the table and knew already what was available and what was not. Instead of asking for a wound protector, he briefly stepped away from the operating table to create a makeshift one out of a plastic sleeve and a plastic drain bent into a circle.

But despite a few differences in equipment, the operating room is a familiar world. Today's operation is a laparoscopic lower anterior resection for colon cancer that is deep in the pelvis and close to the rectum. A less-experienced surgeon would be forced to take the rectum and anus, leaving the patient incontinent and permanently wearing a colostomy bag. New China Hospital is known for pioneering techniques for sphincter-sparing colorectal surgeries, and Yang, who has trained at and been employed at West China for over a decade, is an expert at this laparoscopic surgery. I have seen Yang do this same operation many times in the operating rooms of New China Hospital and as I watched the laparoscopic screen in this operating room, I felt as if we could be back at West China; as if reading my thoughts, he turned to me and said "*see, just like the one from Friday.*"

### *Surgical systems and standardized worlds*

Surgery has never been considered an easily-deliverable health service. Unlike vaccinations or diagnostics, which may only require a single nurse and a single point-of-care test or machine, surgery requires an entire suite of specialized equipment. To even deliver basic surgical care, surgical suites require reliable electricity and running water, oxygen, an anesthesia machine, and essential anesthetic medications; hospitals where surgeries will be performed require radiology and pathology services and basic laboratories. Surgical services are also inherently interdisciplinary, requiring a trained surgical provider and anesthetic provider as well as nursing providers trained in post-operative care. The recent attention toward global surgery marks a shift in global health between disease-oriented vertical approaches to a more integrated systems-based horizontal approach to improving health (Dare et al. 2014). The ability to access safe surgical and anesthesia care when needed requires systems of transportation, physical facilities, and resources, as well as personnel; the ability to do safe surgery indicates the capabilities of an overall health system to handle complex health needs of patients.

The Lancet Commission on Global Surgery, which aimed to describe the importance and feasibility of "safe, essential, life-saving surgical and anesthesia care in low-income and middle-income countries," proposes that there are three so-called "bellwether" surgeries — caesarian section deliveries, laparotomies, and open fracture procedures (Meara et al. 2015). That is, a hospital facility which can do these three basic and key surgical operations should have the functional capacity to handle most other surgical procedures. Though this may be true on a simplistic level, the transition between a hospital which can do these bellwether surgeries and one which can handle more complex surgeries involves significant investments in medical education, infrastructure, and resources.

Investing in surgical services on a country level is affordable, saves lives, and promotes economic growth (Meara et al. 2015), but China needs no encouragement to scale their healthcare system — every hospital in China strives to be larger and more high-tech than its predecessor, to offer more services and to have the latest machines. At community hospitals, the operating or diagnostic suites are points of pride, important tour stops when local doctors show visiting professors around. Often, the community doctors quip that the hardware is all there, and that *we are just waiting for the software and the personnel to catch up*. They echo a sentiment

which has been said about China's growth overall: that infrastructure leads and the hope is that everything else will follow. Presenting data about the growth in healthcare investment, Winnie Yip, a health economist and a professor at the Harvard T.H. Chan School of Public Health asks the audience of Chinese scholars, "the buildings are there, but are the people?" Because of course there are *people*, Professor Yip clearly refers to a certain caliber of people, whose qualifications and abilities would match the specs and features of these state-of-the-art spaces.

Though perhaps not the intention, consult surgeries are one way that people are brought to these buildings. China's investment in hospital infrastructure is crucial for consult surgeries to occur: in order for Yang to comfortably do a lower anterior resection in this community hospital, the operating suites must be equivalent enough. Yang specializes in laparoscopic cases and rarely does open surgery; this hospital does basic laparoscopic cases and has the equipment required. In some cases, West China surgeons go to community hospitals that are much lower resourced and lack specialized equipment with which to do a particular surgery. Often surgeons bring their own equipment, including reusable drills and drill bits worth millions of dollars for orthopedic or neurosurgery cases, borrowed from West China, packaged carefully, and heaved onto trains or carefully brought through airplane security in order for a consult surgery to be possible.

Consult surgeries rely on the standardization of hospitals, of operating rooms, and of operations. Community hospitals once lacked resources and were structurally run-down; even ten years ago, community hospitals were older buildings, poorly lit, and lacking financial resources to invest in newer equipment. In the past decade, local and provincial governments have poured investments into rebuilding these hospitals[45], building new buildings for clinical laboratories, and updating diagnostic, surgical, and anesthetic equipment. Though it is possible to find rundown hospitals lacking in surgical equipment, these medical facilities are just told not to perform operations. West China surgeons told me that even rural hospitals have the necessary equipment to do surgeries; rural surgeons just lack the expertise and training to do surgeries well. These standardized community hospitals are additionally made familiar via the faces of former fellows or colleagues who are often the personal link between a community hospital and an expert surgeon. Repeat visits build additional familiarity and make subsequent returns more likely.

These standardized worlds allow for surgery to travel seamlessly from operating room to operating room, from hospital to hospital. Patients are able to have their scans done at the local hospital, with CT scan images sent via mobile phone to the consult surgeon to evaluate prior to the surgery. Appropriate pre-operative labs are drawn and appropriate post-operative care will be given. A surgeon can arrive, and within a few minutes, be operating on a patient in an operating suite which is familiar and standardized enough that the surgeon is able to complete the operation as if he is at his home institution.

The standardization of surgical operating rooms paralleled the standardization and development of scientific laboratories, and historians of science have examined the connections between the physical and social settings of these spaces and the knowledge produced within them (Shapin 1988, Schlich 2007). In both settings, scientists and surgeons sought to increase their control over environmental factors and over the organisms (cells, animals, or humans) on which they operated. Operating rooms around the world reflect the functional and the symbolic:

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[45] There are approximately 33,000 hospitals in China, a figure which continues to grow by 2-3% each year (China Hospital Industry Report). China has dramatically increased healthcare expenditure by 18% each year, several percentage points above the growth of the Chinese GDP. This has amounted to a quadrupling of government healthcare expenditure (Yip et al 2019), which is dominated by a growth of hospital infrastructure. No other country in recent history has increased funding of healthcare in so short a period of time.

set away from the rest of the hospital, behind access-only doors, and with machines able to measure, regulate, and respond to changes in environment or organism, monitoring and adjusting oxygen levels and blood pressure of a sedated and anesthetized patient based on the surgery's needs. Latour states bluntly that "the only place where [laboratory scientists] are able and good workers is in their laboratories" (Latour 1983: 163). Surgeons can similarly only be "good workers" in their operating rooms, and though operating rooms have become standard, these "good workers" rely also on a set of structures beyond the physical operating rooms which allow surgical bodies to be made mobile. I refer here not to patients as surgical bodies, but to surgeons as surgical bodies: bodies which are capable of performing surgeries, bodies which perform within the healthcare market to provide surgeries at a cost, bodies which are made mobile within a legal and economic structure which allows swift transactions and transportation to occur.

***What norms allows the movement of (surgeon) bodies?***

The commoditization of patient bodies, exploited by biomedical trials and experimental medicines or purchased and sold as part of an illicit organ harvesting practice (Scheper Hughes and Wacquant 2003, Cohen 2005, Rajan 2006), relies on systems and structures which enable the movement of blood samples, organs, or genetic codes. To understand the mobility of these bodies and their commoditization, these scholars ask what *structures* must be in place and what *qualities* of bodies must exist to allow for their movement and transfer across boundaries and through systems? Ong (2016) uses the term "fungibility" to describe DNA sequences reduced from their patient sources to be interchangeable and transferable. The term originates from economic and legal practices where securities or commodities are fungible assets only when made interchangeable within a marketplace. Commodities must be made trade-able, transferable, or movable in order to have value: a kidney cannot be a commodity until immunosuppressants, surgical techniques for transplant, and markets for illicit organs exist. Certain conditions are central to making "bioavailable" organs or eggs; structures and norms regarding the standardization of the human body and of biomedical practice must exist for patient bodies to move easily from one provider to another, or from one medical system to another.

The movement of bodies across geographic borders for the purpose of medical treatment is not new. Global networks and ease of travel have allowed increasingly for fee-paying patients to travel to other countries for lower-cost services, shorter wait times, or experimental procedures. This global medical travel exacerbates an inequitable distribution of medical resources, as wealthy foreign patients drain resources from those who would otherwise receive local services, and lack of regulation result in most foreign medical treatment occurring without legal supervision (Whittaker, Manderson and Cartwright 2010). Beyond the ethical questions of medical travel and medical tourism, what are the structural conditions or norms necessary which make bodies mobile for medical travel, and what motivates such travel?

An August 9th article in the *New York Times* described a new type of medical tourism, initiated by a for-profit company, which arranges for treatment of American patients at Mexican hospitals with their operations done by American surgeons. Though both patient and surgeon must travel to Mexico, the cost is still substantially lower than the cost of medical care in the US: the comparative money saved by insurance companies ultimately benefits both the surgeon (who receives three times their usual compensation) and the patient (who *receives* a $5000 check instead of paying for their medical care). Though one of the patients interviewed was previously reticent, not knowing the quality of care she would receive upon arrival, she describes the factor

that shifted her willingness to travel for her surgery, saying "*[my surgeon] trained at Mayo. You can't do better than that.*" It is this same sentiment which drives consult surgeries: the desire to have access to expert care, especially if that expert care is willing to travel to the patient. The financial incentives for both patient and surgeon are convenient but may not be central to their rationale; a McKinsey report on the market of medical travel noted that most people who are travelling explicitly for medical care do so to seek more advanced technology and better-quality medical care, rather than being motivated by lower cost (Ehrbeck, Guevara, Mango 2008).

Despite the increasing phenomenon of medical travel, this *New York Times* article highlights that contrary to usual forms of medical tourism where patients travel to receive medical care (usually elective surgeries), this company flies in an American surgeon with a well-regarded pedigree to perform the surgery, eliminating risks for the patient of an untrustworthy surgeon. As described in the article, most patients are reticent of the risks of receiving surgery in a foreign medical system; flying in an American surgeon alleviates this fear, though the nursing and healthcare system does not change and the face-to-face interaction with the surgeon may be minimal. As previously discussed, with surgery, it is not the team, but the individual surgeon who matters.

Though medical tourism is not a new phenomenon, the movement of providers (surgeons, usually) seems more novel. Though surgeon mobility has historical precedence, new assemblages allow for the forms of mobility exhibited by *feidao* surgeries. At the turn of the century, prior to first World War, it was relatively common for elite surgeons to visit colleagues in other countries, to learn surgical techniques and to share surgical instruments. However, such practices terminated with the onset of global warfare. While there are still examples of surgeons going to other countries to learn from experts, or to share their expertise (especially cleft palate surgeries, glaucoma surgeries, or other humanitarian surgical missions),

In China, it is surgeons' bodies that are made mobile, the surgeon made a tool (*a flying knife*) which can be moved throughout a network of hospitals or from patient to patient. The widespread practice of consult surgeries in China relies on certain laws, regulations, and norms which allow these surgeries to occur. Most *feidao* surgeons use the formal channels of consult surgeries and notify the hospital so that legal paperwork can be completed. This ensures that if complications arise, the contractual obligations between the hospitals allow institutional legal protections and malpractice coverage to follow West China surgeons. Some surgeons choose not to notify the hospital, taking the risk themselves, especially if their specific departments frown upon consult surgeries and there would be professional consequences within the department if they attempted to file this paperwork. The cash service fee which the patient provides is entirely separate from the nominal official consultation fee paid between hospitals; the cash fee is often magnitudes greater and given "under the table." It is unclear whether the acceptance of this service fee is legal; surgeons seemed to have different interpretations of the regulations, indicative of the lived reality of these regulations. From multiple conversations with surgeons from various departments and stages of seniority, there is evidently no clear-cut answer, and even if one were written in a regulation or law somewhere, no one knows it, no one is policing it, and no one wants to check.

Though the rules around consult surgeries are unclear, the regulations around *hongbao* at New China Hospital are strict and explicitly stated. *Hongbao* cannot be accepted, under any circumstance, *before* a surgery. To do so would be constituted as taking a bribe, and would reflect poorly not only on the individual, but on the department and the entire institution. Due to

widespread patient-physician mistrust in the late 2000s and early 2010s (Tucker et al. 2015), government policies denounced the acceptance of *hongbao* in medical practice, though the enforcement bans on *hongbao* has been hospital dependent and regional. Hospitals in Shenzhen and Guangzhou are well known for still widely accepting *hongbao*, while Beijing is known to unpredictably crackdown on corruption, so fewer doctors accept bribes.

At New China Hospital, a few years ago, a young surgeon accepted a *hongbao* with just a few hundred RMB, was caught on surveillance camera and was promptly fired. The story of his dismissal is shared amongst young new hires, who are warned in whispers that the purported consequences are to be taken seriously. West China doctors are fastidious about not accepting *hongbao* before surgeries, though they say that if patients give them cash *after* the surgery, it is just considered a gift of gratitude. However, this is rarely done. The Chinese culture of *hongbao*-giving sees the *hongbao* as a way of guaranteeing a successful operation, of wishing the surgeon smooth sailing. After a surgery, the concern has worn off, and the pain and challenges of post-operative care take precedence in the minds of patients' families. One West China surgeon joked that whenever patients or their families try to give him cash before a surgery, he pushes it away firmly, but then says slyly that if they wanted to give it to him after the surgery he could accept the money then. "They never do, though," he tells me.

This discussion of *hongbao* and the norms and strict regulations surrounding them is presented in contrast to the payment given after *feidao* surgeries, which operate via a different set of norms and are minimally regulated. While medical tourism seems to be an exaggeration of the commodification of healthcare, neoliberal free markets, and lack of regulation, consult surgeries, despite the presence of a fee, are seen as favors rather than transactions. A consult surgeon is *invited* to come only if a particular patient is deemed worthy of and appropriately requiring expert-level care by the community hospital. The expert surgeon is *selected*: a particular surgeon with a particular expertise aligning with the patient's needs. Rather than the standard channels of medical care where any patient can see any surgeon and demand any service, consult surgeries require personal connections and the mobilization of social capital. Despite the fundamentally transactional nature of the service fee paid to the surgeon, the envelope of cash is not handed over to an unsympathetic teller at a window, but given directly to the surgeon, often presented with both hands and a respectful bow, as gratitude for the *favor* between individuals which has transpired. Consult surgeries are personal: who you are (as the patient or as the surgeon) matters.

Thus, just as much as consult surgeries rely on the minimal enforcement of regulations, these surgeries rely also not on trust in a *profession*, but on trust on the *personal relationships* within the profession. Trust in the overarching profession of surgery is minimal: if such trust existed, the patient would perhaps trust a local surgeon or trust that any surgeon at a tertiary hospital would meet a standard of excellence. Rather, patients place their trust in pedigree and expertise (the West China name) and the personal relationship between the community surgeon and the expert surgeon. Patients trust that this surgeon is better than one they could find on their own; they recognize that the local surgeon is risking social capital and going out on a limb to help them and that favors are being traded in order to make this consult surgery happen. In contrast, the payment given for a medical service in standard healthcare transactions is a *transaction*. With consult surgeries, no structures or regulations are in place that ensure that the patient will give money after the surgery is complete. Thus, the surgery is viewed more as a gift, and the envelope of cash which is (usually) handed to the surgeon after the surgery is complete is a gift in return. The norms around the payments indicate the different interpretation of the

associated fee; these norms and lack of regulations allows for consult surgeries to proliferate and for the bodies of surgeons to be commoditized as tools and their services gifted.

The comparison of medical tourism and itinerant surgeons presents a strange contradiction. Medical tourism often represents the widening of inequity — those who are richer have access to whatever resources they want and can fly wherever they want to be provided with medical services with a side of tourism. In contrast, itinerant surgeons run a guerrilla operation providing medical care to patients who would otherwise not receive it. This, at least is the narrative, as surgeons downplay the significant cash payment. However, the moral argument extends beyond the sense that "if I didn't travel here to do this surgery, this patient would die." It is furthered by the narrative that *feidao* operations provide opportunities for community surgeons to learn from experts, to observe and participate in the care of patients who might otherwise go to tertiary hospitals and to expand their knowledge of complex diseases. Thus, these operations not only make quality surgical care more accessible for patients, it also makes these surgeries more accessible to trainees and community surgeons who wish to learn more complex operations.

Yang's return to this hospital extends the education that Li had begun to receive at West China. Most cancer surgeries are done at large academic tertiary hospitals like West China, but increasingly so, community hospitals are attempting to grow their practice and to keep cancer patients at community hospitals for treatment. Young surgeons like Li observe expert surgeons at West China doing complex surgical oncology operations, and hope to bring knowledge and new techniques back to their community hospital after their visiting fellowship is over. Over the course of several months, many fellows learn not only operative steps, but new managements of diseases and different perspectives on empirical research and clinical care.

These consult surgeries are opportunities to continue learning from experts, to bring them back into the community where their abilities and knowledge is needed. Even junior community surgeons see these consult surgeries as opportunities to meet West China surgeons, forging a connection they might find useful when they themselves pursue their visiting fellowship at West China some years down the road. Chinese society is generally composed of series of overlapping relationships and *guanxi*, and even still, the medical world always feels particularly small: every surgeon knows a physician or administrator at any given hospital – a former classmate, a former colleague, or a former trainee, a friend's relative, a researcher or collaborator from a conference or regional training. These consult surgeries rely on these shadow networks as there is no database of physicians online; one has to be in the know, part of a network of surgeons who know each other and know that they are willing to travel and be consulted and to operate this form of business.

Even between colleagues, consult surgeries are opportunities to learn. Consult surgeries provide an excuse for more frequent visits between friends: a monetary and professional incentive to make an otherwise formidable three-hour drive. Those who leave West China for their hometowns or less prestigious hospitals often have less pressure to publish and to engage with current literature and studies, and conversation around the operating table switches casually between gossip on mutual friends, colleagues, or mentors, and questions about a difficult case or the management of disease with novel treatment options. Often, after the case, local surgeons will ask the West China for advice on a different case, showing pre-operative scans or having them see a post-operative patient to discuss management of complications or next steps.

In addition, some surgeons see *feidao* surgeries as not just benefiting a single individual, but benefiting an entire group of patients, recognizing the role that *feidao* surgeries play in augmenting training, accumulating younger surgeons' case numbers, and allowing more junior

surgeons (employed at renowned institutions) to gain experience with different disease pathologies and surgical anatomies. One surgeon, locally famed for his abilities in laparoscopic surgery, built up his experience largely through consult surgeries. During an operation on a West China patient who had complex anatomy due to multiple prior surgeries, with each organ tightly adhering to its neighbor and fibrous adhesions surrounding the old scar site and new mass, he comments that any other surgeon would have done the surgery open rather than laparoscopically:

> "They don't have my experience though, I've done so many surgeries by going so many places, I've seen all of the strange cases. Every challenging case you have, you work through it, and you learn something new about how to approach the next challenging case. You see enough cases and you start seeing all the different ways the body can vary and you know what to look out for."

All of his travel, his multiple consult surgeries, are presented as the labor necessary such that he can do cases like this. The fellows who are assisting on the case nod their heads solemnly, clearly impressed with his ability to see the anatomy behind such fibrous tissue, as this surgeon shows them how he thinks through which blood vessels can be safely taken in this case.

By his own narrative, all of the consult surgeries done at other hospitals benefit not only those individual patients, but his patients here, today, at West China as well. Additionally, his experience benefits all those present at his surgeries, the visiting fellows, residents, and trainees who learn from his synthesis of his many logged cases at various hospitals: no matter where the expert surgeon operates, whether at his home institution or elsewhere, multiple patients and trainees benefit from his accumulated knowledge.

The phenomenon of flying knives represents the "home-grown" (*ben tu*) innovations which address the specific challenges present in China's ever-transforming medical system. There is both formal and informal value to this form of surgical practice: formal value in that it solves a practical problem for the health system (providing surgical expertise and training in areas where it is less accessible); informal value in the provision of moral fulfillment, financial benefit, and technical growth for consult surgeons. The eruption of a narrative of self that arises from this practice reveals the absence of the individual and moral fulfillment in their daily practice. Understanding the local moral worlds which make possible such *flying knife* practices makes evident not only the structural pressures discussed in prior chapters, but the interpersonal and personal endeavors for meaning making.

The tension between standardization and exceptionalism runs throughout these chapters: *flying knives* embodies this dialectic. Consult surgeries allow for a standardized level of (higher) surgical expertise to be performed at hospitals across the country and to further standardize the ability and techniques of surgeons at rural and community hospitals. Simultaneously, consult surgeries *rely* on the narrative of an individual's exceptional excellence to prompt the diffusion of surgical expertise from high-concentration urban centers to lower concentration areas. Even as the standards of surgical technique continue to rise (as community surgeons point out, they can now do surgeries they could not have imagined doing a decade ago, and are continuing to push themselves to operate at the same level as academic tertiary hospitals), the individual expertise of specific surgeons will always be cultivated and desired.

These *flying knife* surgeries serve as an example of an innovation that comes out of a turn inwards rather than a turn outwards: this practice did not arise out of competition with others (or

imitation of others) or even a desire to be a cut above others, but the proliferation of an organic response to a recognized need. Yet while this practice seems quite natural to the surgeons who engage with it – like many other assemblages of technique, objects, morals, ethics – much has to be in place, accepted, or normalized, for this practice to take place. Understanding the prerequisites to the mobilization of *feidao* surgeons reveals the aspects of standardization or sameness which must be in place for such practices to be possible.

## EPILOGUE

Recently, a front-page article in the San Francisco Chronicle described the death of 2-year-old Ailee Jong during a liver operation. The operation had been done at John Muir Hospital, a hospital recently affiliated with Stanford Hospital and Clinics, part of a "multimillion-dollar partnership …to bring in pediatric doctors to treat more urgent and complex cases" (Gafni and Dizikes 2022, 2) which were geographically farther from the two major pediatric hospitals in the region.

The article describes her stuffed animals and security blanket, and the scene of the operating room where she passed away, with piles of bloodied surgical towels and blood streaked across the floor. It is accompanied by a podcast which asks, "What went wrong at John Muir Hospital?" as well as a video with interviews with Ailee's parents, footage of the hospital, and home videos of the child before her surgery. In the video, Ailee's father describes learning about the Stanford-affiliated hospital and feeling so grateful Ailee could receive care closer to home: "My assumption was that I am getting top notch care – if not best in the country, one of the best in the world – we felt fortunate. But I didn't know what I didn't know."

I do not have the medical expertise to weigh in on "what went wrong," but I was struck by the mere existence of this article. Though medical error is not uncommon in the United States, it felt unusual to see this level of medical detail in an article and for a story of alleged medical error to make front-page of a newspaper. Ten years ago, I had read similar articles while trying to understand the patient physician mistrust in China: media articles lambasting physicians or hospitals for killing a patient, similarly accompanied by photos of grieving parents protesting the loss of their loved one.

In 2015, we wrote about how these sensationalist media articles, which attempted to convey the complexity of medical care but often found experts who were willing to side with the aggrieved families, contributed to a pervasive mistrust of the medical community, which ultimately led to incidents of violence and lack of sympathy towards physicians. We described how these articles were part of a larger milieu: the medical education system, the financial reimbursement and medical insurance system, the medical-legal system which was perceived to be opaque and corrupt. I wondered, as I read this article about Ailee and her family, whether this would become part of a larger trend, buoyed by the politicization of science and medicine during the COVID-19 pandemic, and a subsequent general distrust of physicians, or whether this was just one unusual media article describing a truly unfortunate outcome for a very sick patient.

The conflicts described in the article also paralleled many of my experiences and observations in China. Though the partnership between Stanford and John Muir Hospital had been in existence for ten years, I knew little about it. But the motivations behind this partnership, as described by this article "boost[ing] John Muir's pediatric program by staffing it with Stanford physicians" or "drawing more pediatric patients…[with] complex illnesses to John Muir" or "sending the most complex surgeries to Stanford" mirrored exactly the motivations of the integrative care alliances of New China Hospital that I describe in Chapter 4 and 9.

The rigorous questioning and attention to the attending surgeon and anesthesiologists' degrees and experience parallel the scrutiny of Chinese patients as they attempt to determine whether to stay at their county hospitals or travel a few hours to the academic medical center. The article compared the experience of the two hospitals via their case volume: 200 pediatric

hepato-pancreatic-biliary cases at Stanford over the course of two three years, just two at John Muir. This difference represents something bigger (to do more is to ultimately be better; even though to do one (well) can itself be also significant). As discussed in Chapter 1, a simple comparison normalizing the operationalizing of difference via the fungibility of numbers.

Though entirely hypothetical, as I read about their decision to have the operation at John Muir, I wondered whether if Ailee had been operated on at a county hospital in China, it would have been a "Flying Knife" consult surgery: some well-known and experienced surgeon driving out to do this operation. But that is not the culture or norm in the United States. While two attendings often do cases together (and in this case, another similarly experienced surgeon assisted the primary surgeon), the understanding is that once an individual completes residency and fellowship, they have had sufficient years of training to do an operation on their own, unsupervised.

In Chapter Five, I describe how part of these "flying knife" surgeries is a sense that surgeons can travel alone, landing wherever and operating with what or who is available. But these traveling surgeons often bring their own equipment, not trusting what the local hospital may have, and request to work with familiar names, often junior surgeons who have previously trained (jin xiu) at New China Hospital. They request the best anesthesiologist and are explicit in their communication about what is needed for a case. Operations do not happen in a vacuum: they are shaped by what equipment, blood products, and people are in the room, who and what is available for back-up, the culture of communication, norms about asking for help, systems of transfer, transfusion, scheduling, training.

The elite academic hospitals in China are not so different from the elite academic hospitals in the United States: there are similarities in the tensions and challenges that are faced, navigating the need for standardization, maintaining sufficient patient pools, and training specialists with limited patient volume. Recognizing the similarities in these challenges faced may allow us to learn from other systems, to recognize when innovations may be transferable across contexts and what translation or transformation may have to occur in order for knowledges or practices to travel.

In the aftermath of my dissertation research, the COVID-19 pandemic has made evident that the inability to see similarity rather than difference perpetuates the belief that what happens in a healthcare system in China is not relevant to hospitals and healthcare in the U.S. The belief that China is *so* different from the U.S. places China at arm's length: both too difficult to understand and not worth bridging that divide in knowledge. Ailee's case shows that there is more similarity than we might believe and potential for mutual benefit in seeking to bridge that divide: China's healthcare system is not merely trying to catch up to or mimic the West, and its approach to shared challenges may change biomedical practices worldwide.

A year after I had left China, I caught up with one of my interlocutors. He was checking in on how things were going in the U.S. amidst what was then the Omicron surge. I asked him how he was doing, and he mentioned that things were hard for him: for the first time in the fifteen years since he finished his fellowship, he had had an intra-operative death, also on a young woman. Like the parents of Ailee, the parents of his patient would likely pursue legal recourse. Like the John Muir Hospital, New China Hospital conducted their own review, and stated (to him and to the family) that the medical and surgical care had been appropriate, that there had been no deficiencies, and that this was merely a very unfortunate but statistically possible bad outcome for a complex surgery.

Simultaneously, health systems are also more different than we think in ways that affect ordinary training and practice: even if a surgery looks the same in its steps, in the techniques and instruments used, what motivates this surgery and how this surgery is operationalized is different and important to understand. The premise of this dissertation is that surgery in China is different and that that difference tells us something about China and about the way surgery travels and is transformed. Though surgery in China is shaped by technonationalism defined by historical lineages and political narratives, it is also shaped by the challenges of standardizing surgical training, of prioritizing clinical volume or research productivity, or the debate between centralized specialty care and decentralized integrated care for complex tertiary care. These are tensions that universally make surgery a complex technology to scale, to teach, to transfer.

What does it take to provide high quality surgical care? What are the goals of delivering high quality surgical care and how do those goals shape the surgeries that are performed? How do we continue to push what is possible and performed in the operating room, and how does evidence become knowledge? Surgery in China and Surgery in the United States are different, yet surgeons who strive to deliver high quality surgical care in China grapple with many of the same issues as surgeons in the United States. Surgery in China is neither definitively better nor definitively worse (either statement would be a gross over-simplification). However, a willingness to be curious and understand one world may help us understand, innovate, and question our assumptions in another.

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