

UCSF

UC San Francisco Previously Published Works

Title

Chart stalking, list making, and physicians' efforts to track patients' outcomes after transitioning responsibility

Permalink

<https://escholarship.org/uc/item/6856v7gd>

Journal

Medical Education, 52(4)

ISSN

0308-0110

Authors

Bowen, Judith L
O'Brien, Bridget C
Ilgen, Jonathan S
et al.

Publication Date

2018-04-01

DOI

10.1111/medu.13509

Peer reviewed

Chart stalking, list making, and physicians' efforts to track patients' outcomes after transitioning responsibility

Judith L Bowen,¹  Bridget C O'Brien,² Jonathan S Ilgen,³  David M Irby²  & Olle ten Cate⁴ 

CONTEXT Transitions of patient care responsibility occur frequently between physicians. Resultant discontinuities make it difficult for physicians to observe clinical outcomes. Little is known about what physicians do to overcome the practical challenges to learning these discontinuities create. This study explored physicians' activities in practice as they sought follow-up information about patients.

METHODS Using a constructivist grounded theory approach, semi-structured interviews with 18 internal medicine hospitalist and resident physicians at a single tertiary care academic medical center explored participants' strategies when *deliberately* conducting follow-up after they transitioned responsibility for patients to other physicians. Following open coding, the authors used activity theory (AT) to explore interactions among the social, cultural and material influences related to follow-up.

RESULTS The authors identified three themes related to follow-up: (i) keeping lists to track patients, (ii) learning to create tracking systems and (iii) conducting follow-up. Analysis of participants' follow-up processes as an activity system highlighted key

tensions in the system and participants' work adaptations. Tension within functionality of electronic health records for keeping lists (tools) to find information about patients' outcomes (object) resulted in using paper lists as workarounds. Tension between paper lists (tools) and protecting patients' health information (rules) led to rule-breaking or abandoning activities of locating information. Finding time to conduct desired follow-up produced tension between this and other activity systems.

CONCLUSION In clinical environments characterised by discontinuity, lists of patients served as tools for guiding patient care follow-up. The authors offer four recommendations to address the tensions identified through AT: (i) optimise electronic health record tracking systems to eliminate the need for paper lists; (ii) support physicians' skill development in developing and maintaining tracking systems for follow-up; (iii) dedicate time in physicians' work schedules for conducting follow-up; and (iv) engage physicians and patients in determining guidelines for longitudinal tracking that optimise physicians' learning *and* respect patients' privacy.

Medical Education 2018
doi: 10.1111/medu.13509

¹Division of General Internal Medicine and Geriatrics, Department of Medicine, Oregon Health and Science University, Portland, Oregon, USA

²Department of Medicine, University of California, San Francisco, California, USA

³Department of Emergency Medicine, and Associate Director, Center for Leadership and Innovation in Medical Education, University of Washington, School of Medicine, Seattle, Washington, USA

⁴Center for Research and Development of Education, University Medical Center Utrecht, Utrecht, The Netherlands

Correspondence: Judith L Bowen, Division of General Internal Medicine, Oregon Health and Science University, 3181 SW Sam Jackson Park Road, L-475, OHSU, Portland, OR 97239-3098, USA. Tel: 503 713 3261; E-mail: bowenj@ohsu.edu

 INTRODUCTION

Many physicians work and learn in hospital environments that involve numerous transitions of patient care responsibility. The resultant discontinuities make it difficult for physicians to observe the natural course of their patients' illnesses or the consequences of their clinical decisions. Little is known about what physicians do to overcome the practical challenges to learning that these transitions create. Understanding how physicians respond to care transitions in everyday practice could inform future design efforts to support learning through clinical work.

Understanding learning through clinical practice often emphasises individuals' mental processing, whereby physicians reflect on the consequences of decisions as a means to build knowledge and progressively refine clinical reasoning.¹ For example, when caring for patients on hospital wards, physicians make provisional diagnoses, gather diagnostic test results, elicit input from colleagues, monitor patients' responses to treatment, and observe the natural history of illnesses. As the full manifestation of a patient's illness unfolds, initial diagnostic impressions may evolve into new diagnostic explanations. Each encounter with a patient has the potential to add 'bits and pieces' of information to relevant illness scripts stored in long-term memory.² Although important for knowledge building, the focus on learning as individual mental engagement falls short in explaining how learning occurs when responsibility for decisions about patients transitions to others. How physicians go about getting these bits and pieces of information after care transitions requires closer inspection of social, cultural and material influences on learning in the clinical work environment.

Researchers have argued that the quality of, and physicians' responses to, everyday work experiences shape learning, and that active engagement with the clinical work environment is required for effective learning to occur.^{3,4} Mylopoulos and Farhart studied how experts engage in purposeful improvement through practice as a core component of expert development.⁵ From their work, we learn that rather than being positioned as passive recipients, individuals actively construct the social and material dimensions of their context. Some further argue that social and material dimensions exert influence, shifting attention from the individual to a collective orientation where dynamic

relationships between human and material elements shape learning.^{6,7} In this view, learning is not the acquisition or refinement of knowledge in pursuit of expert practice. Rather, it is 'a process of participating wisely' in everyday work, attuning to the unexpected, and improvising solutions.⁶ As MacLeod and colleagues describe, medical education is 'deeply entangled with materials, technologies, knowledge, physical spaces, nature and objects of all kinds'.⁸

Learning environments that support continuity of patients' care may facilitate learning from clinical work because information about patients' outcomes is readily available.^{9,10} Following up on clinical decisions, however, is more challenging than it might seem. Patients transition between ward-based, specialty and intensive care unit teams as their care needs change. Physicians often work in discontinuous blocks of time, necessitating that patients transition from one clinician to the next.¹¹ Pressure to be efficient results in transitioning some patients from in-patient to out-patient settings before definitive outcomes are known. Together, these organisational structures result in frequent patient care discontinuities, challenging physicians to adapt their approaches to learning in practice.^{12,13} Because the majority of physician training takes place in hospital settings where discontinuity is the reality,¹⁴ understanding how physicians respond to these challenges may shed some light on the impact of discontinuity on learning.

In settings characterised by discontinuities, we can anticipate that processes of seeking follow-up information about patients will involve social and material aspects of the learning environment. One theoretical lens, activity theory (AT), may be useful for understanding such processes. AT, a framework within the larger group of sociomaterial theories, extends sociocultural views of learning to include ways that materials influence individuals' engagement in work activities.⁸ Originally, Vygotsky described individuals engaging in goal-directed action mediated by artifacts where materials and humans 'act upon one another'.¹⁵ Attempting to bring about change to achieve a goal is the individual's essential activity.¹⁶ For example, physicians' activities of attempting to locate and manage information about prior clinical decisions serves goals of learning from patient care. Clinical documentation (the artifacts) stored in electronic health records (EHRs) mediates these activities.

Engestrom expanded Vygotsky's model to include elements of the larger social context in which the activity takes place.⁷ Although mediated action remains the essential element, this second-generation AT draws attention to interactions between individuals and their communities, including rules and divisions of labour that define social engagements. Tensions that result from these material and social interactions are a normal part of work activities. Such tensions are often the source of change that leads to learning.⁷

To examine how physicians address the learning challenges created by frequent transitions of responsibility, we sought to understand physicians' activities in practice as they seek information about their patients. In this investigation, we explore how physicians respond to discontinuity of patient care and what social, cultural and material factors influence these responses.

METHODS

The data collected for the analysis described in this paper were part of a larger study that explored the phenomenon of physicians' experiences with transitions of patient care responsibility more broadly. We employed a constructivist grounded theory approach¹⁷ and conducted semi-structured interviews. We used a critical incident methodology as part of the interview process, employing triggers to prompt participants' recollections of specific clinical experiences related to transitions of responsibility.¹⁸ We used probing questions to generally explore the strategies and routines participants *deliberately* used to find out what happened to patients after they transitioned responsibility to other physicians before the diagnosis had been determined. We asked participants to describe (i) what information they were seeking, (ii) where they looked for information, and (iii) what supported or interfered with their abilities to find out what happened to patients that had previously been under their care. The institutional review board at Oregon Health and Science University approved the study.

Participants

Between January and June 2016, the principal investigator (PI) recruited via e-mail a convenience sample of internal medicine (IM) hospitalist physicians and IM residents. The PI, a physician and education

researcher, was familiar with participants' work context but had no supervisory or evaluative relationships with them. Participation was voluntary and e-mails assured participants of privacy and confidentiality. Because we were interested in both established and emergent approaches, we purposefully sought participants across a wide spectrum of experience. Participant demographics are shown in Table 1.

Setting

Recruited participants worked in a tertiary care academic (University) hospital or its affiliated Veterans Affairs (VA) hospital. Transitions of responsibility occurred frequently in these practice settings with no curricular or organisational expectation of ongoing follow-up for transitioned patients. In this setting, residents worked in both hospitals and hospitalists worked in either the University or VA hospital but not both.

Analysis

The PI conducted, transcribed and anonymised all of the 1-hour interviews. Because we analysed data iteratively alongside data collection, we made slight modifications to the interview guide, probing for disconfirming examples in later interviews. After the sixteenth interview, the PI conducted two additional interviews to ensure sufficient information to support identified themes and to check for alternative perspectives.¹⁹ These offered no new

Table 1 Interview participants' demographics

Total	18
Gender (female)	10 (56%)
Hospital	
University only	6
Veterans Affairs (VA) only	5
Both university and VA*	7
Experience level, residents	7 (total)
Postgraduate year 1 (GPY1)	2
Postgraduate year 2 (PGY2)	3
Postgraduate year 3 (PGY3)	2
Experience level, hospitalists	11 (total)
0-<5 years	5
5-<11 years	4
>11 years	2
* All residents worked in both settings; none of the hospitalists worked in both settings.	

insights so the authors deemed the sample sufficient to address the study purpose.

Three authors analysed the data: the principal investigator (JB), an experienced health professions qualitative researcher (BO) and an emergency medicine education researcher (JI). Based on anonymised transcripts from the first two resident and hospitalist interviews, we developed open codes, which we each applied to one new transcript. We discussed and further refined code definitions, then individually applied them to additional transcripts until the coding structure appeared stable. JB then used Dedoose (SocioCultural Research Consultants, LLC, Manhattan Beach, CA, USA) to code all transcripts. Following open coding, the authors discussed findings, noting participants' frequent references to list-making as a tool that both facilitated and inhibited their follow-up strategies. This discovery led us to consider activity theory⁷ during the process of axial and selective coding, allowing us to account for interactions among the social, cultural and material factors related to follow-up activities. Thus, our axial and selective coding procedures focused on interactions between our participants and their material worlds, with a specific eye toward possible tensions that might be resolved through participants' activities. All authors reviewed the representativeness of the proposed thematic structure and differences were resolved through discussion.

RESULTS

Eleven IM hospitalists and seven IM residents, ranging in experience from the first postgraduate training year to more than 11 years as academic hospitalists, completed interviews. All participants described instances where they wanted to know what happened to at least a subset of the patients they had cared for and transitioned responsibility for to others. The nature of their curiosity varied,¹⁸ but all acknowledged the value of having a system for tracking prior patients. Despite this desire, all experienced numerous challenges (technological, regulatory, volume and time) and described ways they addressed these challenges. We also heard stories of follow-up occurring serendipitously through hallway conversations, text messages between team members and phone calls. We focus here only on the systems and habits participants *deliberately* used to track patients.

In the context of patient care discontinuity, we first describe contextual factors and then report three

themes related to conducting deliberate follow-up on patients transitioned to others: (i) keeping lists to track patients, (ii) learning to create tracking systems and (iii) conducting follow-up using lists and tracking systems. Throughout, we describe barriers and strategies to overcome challenges. We then discuss these results as an activity system with information about patients' outcomes as the object pursued in an effort to learn through clinical work. For representative data excerpts below, identification number and experience level are indicated for residents as R# and postgraduate year (PGY) level, and for hospitalists as H# and year range, to preserve anonymity.

Contextual factors

Participants described structural aspects of the clinical work environment that made it difficult to track the consequences of their prior decisions and resultant patients' outcomes. Frequent rotation changes made 'remembering everybody you're caring about' challenging [R2; PGY1] and tracking patients was difficult 'when you rotate off because then you're on another busy service and you often don't follow up' [F8; 0–2 years]. Although residents appreciated having time for self-care, duty hour restrictions introduced conflict for some who perceived that shift work might lead to an attitude of 'clocking out, I'm done with that', further describing a desire for a system 'where you knew you were going to have time to follow up later on' [R6; PGY3].

Patient transitions *between* health care systems also made tracking difficult. A hospitalist described this as 'especially true for the cases we're most likely to be interested in ... the really difficult cases that are transferred in [from an outside hospital] for diagnostic evaluation ...' [F10; 3–4 years]. After discharge, information about these patients' clinical courses was rarely available for subsequent review and learning.

Keeping lists to track patients

All participants made lists of some type to track patients they wished to follow after transitioning responsibility for their care. For some, simple recollection of their prior patients worked until the volume of their patients exceeded memory capacity.

Electronic health record lists

Most participants used the EHR to make lists. Resident participants worked in two different

hospitals and setting up these lists was easier in one EHR than the other. In the first hospital, participants were able to drag and drop patients' names into personal lists. Then, when going back into the EHR, they 'just click [the patient's name] and then click right into the chart' [F10; 3–4 years]. This system also had the capacity to add a sticky note, which served as a 'memory prompter ... the EHR equivalent of a journal' [F9; 3–4 years].

In the second hospital, creating a computer-based list was more cumbersome. Participants had to remember the patient's name and identifying number, and transfer this information into a linked record system. Challenges in using this system led to concerns about patient confidentiality and 'paper trails'. Participants found it 'hard to find places to write down patients' names confidentially' [R5; PGY2]. A newly hired hospitalist said, 'apparently, there's a way to [make a list] but I can barely even log into that system and get past the first screen ...' [F7; 0–2 years]. A senior faculty member remarked, '[I have to] get somebody to walk me through how to do that' in the linked system [F15; 8–10 years]. Constraints in this system also limited the usefulness of the list. One resident remarked, 'I can't give a "one-liner" so sometimes I forget who people are' [R1; PGY1].

Because the system in the second hospital was more difficult to access and maintain, many created workaround systems to facilitate tracking. For example, one resident said, 'I just open a random note [in the patient's chart] and keep it incomplete so that it's just in my in-basket as an alert' [R7; PGY3]. Similarly, a hospitalist said, 'as the attending you have to sign the discharge summary. So, generally, I let my co-signatures go a little overdue because it's the easiest way to track pending issues on a patient' [F16; 8–10 years].

Paper lists

Some participants used paper lists, often as a holdover from tracking habits that predated implementation of EHRs. 'I keep cards on patients, not as dutifully as I used to as a resident but most of the time I'll have a card with the name and the last four [of the record number]. It gives me an opportunity to go back and look' [F10; 3–4 years].

Keeping paper lists raised concern about losing follow-up opportunities. A resident said, 'Mine's just a pen and paper list that I keep in my white coat which is so silly because I could accidentally throw it

away with my daily scribbles at the drop of a hat and then that's a year's worth of patients that are gone' [R2; PGY1]. Paper lists also raised concerns about security breaches of personal health information (PHI). Some abandoned their paper-based habits, saying 'I don't actually keep last fours anymore because a patient safety officer came by my office and saw my stack of cards and was not very happy' [F7; 0–2 years]. Some maintained these workaround paper systems even in the face of 'essentially having to violate patient privacy rules' [F12; 5–7 years], implying that the value of easily tracking patients exceeded the risk of getting caught with PHI in hand. 'The time [it takes to track patients] I actually worry about less than the fact that I'm technically violating hospital rules by keeping cards. We've been discouraged from keeping any sort of records, which I think is a detriment ... So, that's one thing that worries me. Someone will eventually find my stack of papers in my office and I'll be in trouble about that' [F10; 3–4 years].

Learning to create tracking systems

Most residents were in the process of developing tracking systems for themselves and actively experimented with different systems over time. A resident said, '... every week within a rotation I'll try something different because I haven't found one thing ... that has clicked and worked' [R2; PGY1]. Some relied on memory, saying, 'If I didn't know the diagnosis when I stopped working with [the patient], I don't necessarily have a system to routinely [go back and look them up]. But if they kind of come to mind when I'm looking through [my recent patients tab], I'll check ...' [R5; PGY2].

Some residents had created lists but then found them to have limited utility for learning at a later time-point. '... I haven't added anybody to this list for a while. Partly because the [patients] I picked to put on the list weren't very interesting afterwards and then the [patients] that I wanted on there I can't find. I just haven't made a very good habit of putting patients on the list' [R5; PGY2].

Developing a patient tracking system commonly occurred through informal guidance from peers, yet experiences varied. Learning through trial and error was common, and guidance was practical, focused on *what works* rather than *why it might be useful*. One resident said, 'I'd been taught to keep a list ... whether it's interesting patients or patients I was compelled to follow up on' [R2; PGY1].

Another resident disagreed, saying, ‘... no one ever showed me a system [for follow-up]’ [R5; PGY2]. A new hospitalist expressed a similar sentiment saying, ‘Somebody mentioned to me that he kept a log of all [his] patients and [would] go back and look, and I thought that’s a great idea ... But other than that, no, it’s not something that’s role-modelled, not something that’s talked about’ [F7; 0–2 years].

Colleagues shared tips with others, including near-peer modelling for learning to optimise one’s system. A hospitalist described, ‘through a colleague I just discovered there’s a sticky note function where you can write yourself notes ... when you build your patient lists’ [F13; 5–7 years]. Participants used these electronic notations to make their lists more useful for future follow-up.

Once participants had established a tracking process, many realised that maintaining the list would require effort to keep it relevant and useful. One resident lamented that the lists ‘get big and bulky quite quickly’ [R4; PGY2], whereas another reported ‘I’m already up to 50 patients, so I can’t keep them straight without a trigger’ [R1; PGY1]. Residents and hospitalists used varying strategies to organise and cull their lists. An experienced hospitalist used name recognition to guide efforts to trim the list. ‘When it gets too long and ... I’m having trouble remembering who the person is the second I look at the name, then it’s probably time for them to get off the list’ [F13; 5–7 years].

Participants abandoned their tracking systems when their careers had evolved in ways that meant maintaining the process was no longer feasible. One senior hospitalist said, ‘It used to be that I had a process ... I have no time for that anymore. I will track something for a couple of days when I go off service because I still have that team list assigned. [After that,] I don’t track those anymore. It’s just gone’ [F15; 8–10 years].

Conducting follow-up using lists and tracking systems

Empowered by their tracking systems, participants found multiple learning opportunities when conducting follow-up. Lists were helpful for ‘organising my own follow-up on unanswered questions and clinical tests that were outstanding at the time I handed [patients] off or discharged them’ [F8; 0–2 years]. Chart review typically involved going ‘back to the most recent primary care note ... to see how things have changed in the

thinking since I last saw them’ [F10; 3–4 years], reviewing discharge summaries if patients were readmitted, and reviewing autopsy reports after a patient’s death. When a specific question needed to be answered, the search was narrow and directed: ‘I’m going for something really targeted like the lab value I need to know’ [F10; 3–4 years].

In addition to using lists as visual cues, a hospitalist described making electronic calendar appointments as reminders for longer-term follow-up. ‘For cases where I’m curious how things will happen over time or their diagnostic tests will take some time to return, I will either put them on a [calendar] reminder or keep a list taped up in [my office]. I’ve alternated between systems and will, at a designated interval, follow up on a case’ [F12; 5–7 years].

EHR portability facilitated follow-up. A hospitalist recalls, ‘I was having dinner with my kids and I logged into the chart’ [F13; 5–7 years], using her phone. A resident described logging into his computer while watching television, which made the extended workday not ‘feel as bad because I’m doing this for fun’ [R1; PGY1].

Most participants referred to conducting follow-up in the EHR as *chart stalking*. For example, a resident said, ‘I chart stalk almost everybody that I see’ [R6; PGY3]. An experienced hospitalist remarked that ‘chart stalking’ was the primary way of finding out what happened to patients. For most participants, chart stalking took place in the immediate transition period and up to several days thereafter. Two participants, however, described maintaining and using lists to go back a year or more to see what happened to some patients.

All participants mentioned the time-consuming nature of tracking and some described the importance of making this activity an intentional part of work. A hospitalist described his approach to managing time conflicts: ‘I think that it’s actually very time consuming to follow up every patient. I set [time] aside to follow up patients and sometimes actually come into the hospital to use the computer just to follow up patients and sometimes I’d do it from home. But I schedule time each week’ [F12; 5–7 years].

Following up as an activity system

Viewing our findings through the lens of AT, we identified the six elements of an activity system in our data: subject, object, tools, communities, rules

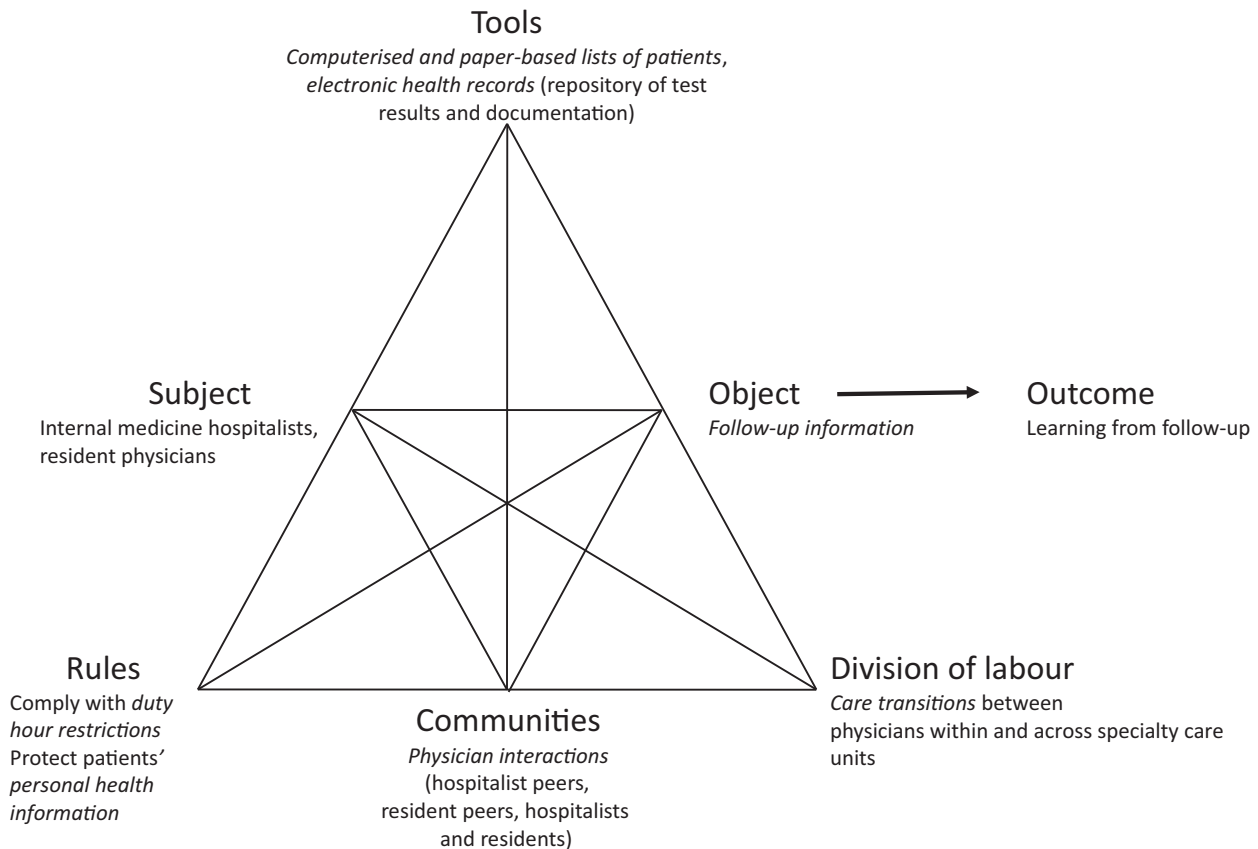


Figure 1 Activity system for tracking patient care follow-up. (Adapted from⁷ with permission of Taylor & Francis Ltd). Codes from qualitative analysis associated with each element of the activity system are shown in italics.

and division of labour (Fig. 1).⁷ The *subjects* of this activity system were faculty members and resident physicians whose *object* was information about patients' outcomes after care transitions. Specialised care (e.g. transitioning patients from hospital wards to intensive care units) and work assignments (e.g. block rotations) required *divisions of labour* within the work community, necessitating tracking systems for locating information about patients' outcomes (the *object*). When EHRs (*tools*) afforded annotated list making so that subjects could keep track of patients for later follow-up, they often achieved the *outcome* of learning about the consequences of prior clinical-reasoning decisions. When these same tools were cumbersome, subjects used different tools (paper lists) to facilitate their objective. This use of paper lists created tension in the activity system because subjects perceived the *object* (information about patients' outcomes) to be at odds with their obligation to protect patients' health information (a *rule* in the social system). For resident physicians, requirements to adhere to duty hour restrictions (another rule) influenced how they achieved the *object* (information about patients' outcomes) of the activity system. Through informal learning, the

community of peers influenced how subjects learned to use the tools available to them. When physicians were motivated to follow-up,¹⁸ this activity system served the *outcome* of learning about the consequences of prior clinical decisions and patients' outcomes.

DISCUSSION

Frequent transitions of responsibility for patients often raise concerns about patient safety and quality of care. Prior studies describe adverse consequences^{20–22} and recommend improved communication strategies.^{23–26} Our focus on the potential learning consequences of frequent transitions adds another dimension to the complexity of discontinuity. The residents and hospitalists we interviewed developed and adapted strategies for bridging discontinuities of care. They made lists and used them to track patients for the purpose of learning from prior clinical decisions. Knowing the consequences of prior clinical reasoning is likely to stimulate clinicians to solidify or adapt reasoning approaches to similar patients in the future.²⁷ Our findings illuminate how technological

advances provide workplace affordances for and barriers to learning from the consequences of clinical decisions. Our findings also illustrate the haphazard ways that physicians develop skills to track patients for learning. When we considered our results as an activity system, participants appeared to be working toward balancing several tensions. The object (information about patient outcomes) was challenging to obtain when EHR systems exerted constraints, patients' health information needed protecting, and tracking patients competed with other demands. We elaborate on these tensions and how they inspired participants to adapt.

Balancing EHR constraints with tracking

EHR tools that mediated physicians' actions to obtain and manage the desired follow-up information created tensions for participants. EHRs, lists and participants acted upon each other in several ways. When the EHR facilitated list making, adding patients could be done with less thoughtfulness but it resulted in unmanageable lists. 'Bulky' lists required further time investment to develop more selective approaches. When making lists in the EHR was difficult, participants created workarounds. A strong desire to learn from patient care led many to keep track of patients on paper or leave unfinished chart notes as surrogate lists in the EHR. In some cases, barriers to using the EHR led participants to abandon the information-seeking activity altogether.

Balancing regulations with tracking

Workaround paper lists put patients' PHI at risk, creating tension between the object, information about patients' outcomes and rules for protecting patients' PHI. Participants responded to this tension in different ways: those who valued the ease of paper-based tracking over potential sanctions continued this approach, whereas others who wished to avoid sanctions gave up their paper lists and any systematic approach to tracking information about patients' outcomes. Failure to protect patients' PHI could have serious consequences. Widespread use of paper lists as a workaround solution should serve as an incentive to enhance EHR features to make tracking easier so that physicians can readily achieve their goals of learning from caring for patients.

Balancing competing demands with tracking

Participants frequently cited time as a problem because of competing demands while creating,

maintaining and using their lists to learn from patient outcomes. Viewed in this way, time is not situated within the activity system whose object is tracking information. Rather, each participant was part of more than one activity system operating simultaneously. These other activity systems directed attention to other work responsibilities and a work-life balance. Others have described these complex dynamic tensions as tenuous 'knots' where elements of different activity systems variably exert influence over an individual's actions.^{28,29} Knots form and unravel as physicians attempt to manage time and balance competing demands.

Although an uncommon finding, a few hospitalists tracked patients for educational reasons for up to a year, long after their formal patient care responsibilities had ended. Although EHRs enable learning through work in ways not previously available to physicians, record availability and accessibility also raise important questions about patient privacy. The tension between appropriate tracking in the service of learning and limits to tracking in the service of protecting patients' privacy deserves our thoughtful attention.

Recommendations

To address these tensions, we make four recommendations. First, EHR proprietors should collaborate with physicians (and other health professionals) to optimise EHR tools for learning purposes in ways that eliminate the need for paper lists and improve tracking efficiency. Others suggest ways of improving EHR communication functionality to address patient safety concerns and prevent errors.^{30,31} Our findings suggest the need to add functionality that mediates physicians' activities of tracking patients in positive ways. Second, given the learning value our participants placed on tracking and the haphazard way in which they learned to do this, our findings suggest a training gap. Programmes should address this gap, supporting physicians' skill development for creating and maintaining EHR-based lists that facilitate follow-up information for learning. Efforts should include periodic training updates as necessary to keep up with system-specific EHR enhancements. Third, programmes and health systems could dedicate time within physicians' work schedules for the purposes of conducting follow-up in order to learn. Fourth, as role models for medical students, residents and practising physicians should engage in discussions about longitudinal patient tracking for learning, and invite patients to

share their perceptions of the reach of implied consent. More research is needed to clarify the extent of longitudinal patient tracking among clinicians broadly. Empirical evidence should inform policy and guidelines should address system barriers that interfere with learning *and* respect for patients' privacy. Both of these goals are in the best interest of patients.

Limitations

Our study has limitations. Our decision to interview volunteer IM hospitalists and residents at a single academic medical centre limits the conclusions we can draw from our findings. Approaches to tracking patients may be different for other physician specialties, such as procedure-oriented outcome specialties where the consequences of actions may be more readily known or the structure of training and practice may be less discontinuous. Our interviews focused on managing patient follow-up in hospital settings where episodic care is the norm. We are aware that EHRs commonly push information to longitudinal (e.g. primary) care clinicians and would expect physicians to use different approaches in those settings. Participants reported their perceptions of the functionality of two different hospital EHRs in one academic health system, which may not represent configurations of similar systems elsewhere or actual capacity of the specific EHRs to serve participants' desired list-making functions. We limited our analysis to the deliberate actions taken by participants when creating systems for following up. Participants also found out what happened to their patients serendipitously, so our findings should not be viewed as the only means by which continuity of information is restored.

CONCLUSION

In clinical practice environments characterised by discontinuity, the lists of patients that physicians made served as tools for guiding the gathering of information about patients' outcomes. The lens of activity theory helped us to interpret the tensions participants described, to 'hold open their controversies',⁶ and describe their adaptive learning responses when engaged in creating, maintaining and using their tracking systems. We uncovered tensions we believe are worthy of further investigation. Multiple perspectives (protecting patient privacy, respecting informed consent, optimising EHR systems and

learning from experience) will be needed to find the optimal path forward.

Contributors: JLB conceptualised the study, collected, analysed and interpreted the data, drafted and critically revised the manuscript, gave final approval and agreed to be accountable for all aspects of the work. BCO'B contributed substantially to the study conception, data analysis and data interpretation, critically revised the manuscript, gave final approval and agreed to be accountable for all aspects of the work. JSI contributed to the data analysis and interpretation, critically revised the manuscript, gave final approval and agreed to be accountable for all aspects of the work. DMI and OtC contributed substantially to the study conception, critically revised the manuscript, gave final approval and agreed to be accountable for all aspects of the work.

Acknowledgements: The authors wish to thank the study participants for volunteering their time in support of this research.

Funding: None.

Conflicts of interest: None of the authors has competing interests.

Ethical approval: The Oregon Health and Science University Institutional Review Board approved this study (Reference number STUDY00015374).

REFERENCES

- 1 Eva K. What every teacher needs to know about clinical reasoning. *Med Educ* 2005;**39** (1):98–106.
- 2 Charlin B, Boshuizen HPA, Custers EJ, Feltovich PJ. Scripts and clinical reasoning. *Med Educ* 2007;**41** (12):1178–84.
- 3 Billett S. Learning through health care work: premises, contributions and practices. *Med Educ* 2016;**50** (1):124–31.
- 4 Watling C, Driessen E, van der Vleuten CPM, Lingard L. Learning from clinical work: the roles of learning cues and credibility judgements. *Med Educ* 2012;**46** (2):192–200.
- 5 Mylopoulos M, Farhart W. "I can do better": exploring purposeful improvement in daily clinical work. *Adv Health Sci Educ* 2015;**20**:371–83.
- 6 Fenwick T. Sociomateriality in medical practice and learning: attuning to what matters. *Med Educ* 2014;**48** (1):44–52.
- 7 Engestrom Y. Expansive learning at work: toward an activity theoretical reconceptualization. *J Educ and Work* 2001;**14**:133–56.
- 8 MacLeod A, Kits O, Whelan E, Fournier C, Wilson K, Power G, Mann K, Tummons J, Brown PA. Sociomateriality: a theoretical framework for studying distributed medical education. *Acad Med* 2015;**90**:1451–6.
- 9 Sargeant J, Mann K, Sinclair D, Ferrier S, Muirhead P, van der Vleuten CPM, Metsemakers J. Learning in

- practice: experiences and perceptions of high-scoring physicians. *Acad Med* 2006;**81**:655–60.
- 10 Mylopoulos M, Lohfield L, Norman GR, Dhaliwal G, Eva KW. Renowned physicians' perceptions of expert diagnostic practice. *Acad Med* 2012;**87**:1413–7.
 - 11 Bernabeo EC, Holtman MC, Ginsburg S, Rosenbaum JR, Holmboe ES. Lost in transition: the experience and impact of frequent changes in the inpatient learning environment. *Acad Med* 2011;**86**:591–8.
 - 12 Regehr G, Mylopoulos M. Maintaining competence in the field: learning about practice, through practice, in practice. *J Contin Educ Health Prof* 2008;**28** (S1): S19–23.
 - 13 Wright SM, Durbin P, Barker LR. When should learning about hospitalized patients end? Providing housestaff with post-discharge follow-up information. *Acad Med* 2000;**75**:380–3.
 - 14 Ellman MS, Tobin DG, Stepczynski J, Doolittle B. Continuity of care as an educational goal but failed reality in resident training: time to Innovate. *J Grad Med Educ* 2016;**8**:150–3.
 - 15 Vygotsky LS. *Mind in Society. The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press 1978.
 - 16 de Feijter JM, de Grave WS, Dornan T, Koopmans RP, Scherpbier AJJA. Students' perceptions of patient safety during the transition from undergraduate to postgraduate training: an activity theory analysis. *Adv Health Sci Educ* 2011;**16**:347–58.
 - 17 Charmaz K. *Constructing Grounded Theory*. Los Angeles, CA: Sage Publications Ltd. 2014.
 - 18 Bowen JL, Ilgen JS, Irby DM, ten Cate O, O'Brien BC. "You have to know the end of the story." Motivation to follow-up after transitions of clinical responsibility. *Acad Med* 2017;**92**:S48–54.
 - 19 Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. *Qual Health Res* 2016;**26**:1753–60.
 - 20 Denson JL, Jensen A, Saag HS, Wang B, Fang Y, Horwitz LI, Evans L, Sherman SE. Association between end-of-rotation resident transition in care and mortality among hospitalized patients. *JAMA* 2016;**316**:2204–13.
 - 21 Petersen LA, Brennan TA, O'Neil AC, Cook EF, Lee TH. Does housestaff discontinuity of care increase the risk for preventable adverse events? *Ann Intern Med* 1994;**121**:866–72.
 - 22 Lofgren RP, Gottlieb D, Williams RA, Rich EC. Post-call transfer of resident responsibility. *J Gen Intern Med* 1990;**5**:501–5.
 - 23 Allen S, Caton C, Cluver J, Mainous AG, Clyburn B. Targeting improvements in patient safety at a large academic center: an institutional handoff curriculum for graduate medical education. *Acad Med* 2014;**89**:1366–9.
 - 24 Johnston MJ, Arora S, Pucher PH, McCartan N, Reissis Y, Chana P, Darzi A. Improving escalation of care: a double-blinded randomized controlled trial. *Ann Surg* 2016;**263**:421–6.
 - 25 Starmer AJ, O'Toole JK, Rosenbluth G et al. Development, implementation, and dissemination of the I-PASS handoff curriculum: a multi-site educational intervention to improve patient handoffs. *Acad Med* 2014;**89**:876–84.
 - 26 Rosenbluth G, Bale JF, Starmer AJ, Spector ND, Srivastava R, West DC, Sectish TC, Landigran CP, I-PASS Study Education Executive Committee. Variation in printed handoff documents: results and recommendations from a multicenter needs assessment. *J Hosp Med* 2015;**10**:517–24.
 - 27 Schiff GD. Minimizing diagnostic error: the importance of follow-up and feedback. *Am J Med* 2008;**121** (5 Suppl.):S38–42.
 - 28 Varpio L, Hall P, Lingard L, Schryer CF. Interprofessional communication and medical error: a reframing of research questions and approaches. *Acad Med* 2008;**83** (10 Suppl.):S76–81.
 - 29 Larsen DP, Wesevich A, Lichtenfeld J, Artino AR Jr, Brydges R, Varpio L. Tying knots: an activity theory analysis of student learning goals in clinical education. *Med Educ* 2017;**51** (7):687–98.
 - 30 Schiff GD, Bates DW. Can electronic clinical documentation help prevent diagnostic errors? *N Engl J Med* 2010;**362**:1066–9.
 - 31 Smith M, Murphy D, Laxmisan A, Sittig D, Reis B, Esquivel A, Singh H. Developing software to "track and catch" missed follow-up of abnormal test results in a complex sociotechnical environment. *Appl Clin Inform* 2013;**4**:359–75.

Received 31 May 2017; editorial comments to author 14 August 2017, accepted for publication 16 October 2017