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### Publication Date

2018-09-01

### DOI

10.1016/j.inat.2018.04.012

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Peer reviewed



Published in final edited form as:

*Interdiscip Neurosurg.* 2018 September ; 13: 124–128. doi:10.1016/j.inat.2018.04.012.

## A novel integrative healing services approach for neurosurgery inpatients: Preliminary experiences and cost calculations

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### Abstract

**Background:** Neurosurgery inpatients are oftentimes critically ill, and face significant stress, post-operative pain, and/or emotional distress. As a result, the use of non-pharmacologic, alternative therapies as adjuncts in surgical care may benefit this patient population. Hospital economics related to integrative services may also provide additional incentive to providing alternative therapies. This study characterizes and evaluates how Integrative Healing Services (IHS) affects patient pain levels and length of stay. We also performed a literature review to examine national trends in inpatient integrative healing.

**Methods:** An IHS team (e.g. acupuncture, healing touch, music therapy, pet therapy, and counseling) was incorporated into the treatment regimen of neurosurgery inpatients (with >4days of stay) with chronic or intractable pain, stress or depression, and/or patients intolerant to or who failed physical or occupational therapy.

**Results:** 34 charts were retrospectively reviewed, with 17 patients receiving IHS (11 cranial and 6 spine cases), and 17 age and gender matched controls receiving routine care (11 cranial and 6 spine patients). Overall, 71% (12/17) of patients had a reduction in pain medication consumption, with 55% (6/11) of cranial and 100% (6/6) of spine patients reporting a reduction compared to baseline. The average pre-treatment pain-scale score was 5.5 out of 10 across all patients, while the average post-treatment pain-scale score was 3 out of 10 (p<0.01). 59% of patients had improved mobility. The average length of stay in the IHS group was 12.6days, and 19.6days in the routine care group (range 4–45) (p<0.01).

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The authors report no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.inat.2018.04.012>.

**Conclusions:** IHS intervention may be an effective option for treating pain and decreasing hospital length of stay. National trends support the use of integrative healing and will likely continue to increase as further studies are performed.

### Keywords

Neurosurgery; Socioeconomic; Clinical outcomes; Healing touch; Therapy

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## 1. Introduction

As “pay-per-performance” and “pay-per-reporting” are increasing in popularity in the modern health care era, the socioeconomic value of patient satisfaction is becoming an exceedingly important tool to examine hospital quality. Hospital Consumer Assessment of Healthcare Provider and Systems (HCAHPS) surveys are being used as a method to standardize and compare hospitals across the country so that patients can compare these hospitals on an “apples-to-apples” basis. This survey focuses on nine key topics related to a patient’s hospitalization which include responsiveness of hospital staff and pain management amongst others [1]. The results of this survey will be tied to Centers for Medicare and Medicaid (CMS) payments to hospitals. Furthermore, pain control, mobility, and length of stay are important variables that significantly impact patient satisfaction and outcomes. One difficulty with focusing on these specific topics is that there are a variety of other factors that can also affect patient satisfaction. Interestingly, studies have shown that introduction of a variety of alternative interventions have improved patients’ experience and subsequent overall HCAHPS scores [2–4]. For instance, a recent study examining inpatient music therapy demonstrated improved patient perception of hospital quality and also decreased their overall perception of pain [4]. Hospitals and providers are increasingly being graded and reimbursed based on patient satisfaction through a variety of standardized surveys, highlighting the importance of incorporating an integrative health services team in patient care to enhance patient satisfaction.

Inpatients on the neurosurgery service are often the most critically ill patients in the hospital and are admitted for a variety of different illnesses including brain tumors, chronic back pain, and trauma. These patients often have significant stress, pain from surgery, and physical and emotional distress related to their underlying disease process. Because of these underlying issues, patients may have an excellent clinical outcome from surgery but may still be unhappy because of depression, chronic pain or the nature and severity of their underlying disease [5,6]. These issues can manifest themselves as a decreased satisfaction with their hospitalization, increased pain related to surgery, and intolerant of physical therapy. This may also lead to an increased length of stay. As such, the use of non-pharmacologic, alternative therapies as adjuncts in surgical care may play an important role in this patient population.

For patients with severe postoperative pain, the neurosurgery service has the ability to consult the acute pain service, which delivers excellent pain control using a variety of medication therapies and Social Work for assistance with social issues they may be dealing with [7,8]. Unfortunately, there are few other options currently available to treat the other

major issues these patients may be facing with regards to their emotional and physical well-being. The authors created an Integrative Healing Services (IHS) team of providers that included acupuncture, healing touch, music therapy, pet therapy, and counseling to address some of these issues. IHS can not only improve pain management, but can simultaneously reduce side effects and increase safety by avoiding adverse reactions associated with reliance on opioid medications for pain management. The IHS team focused on inpatient neurosurgery patients with significant pain, depression, and increased length of stays. We aimed to assess the utility of this IHS approach, and report our institutional experience in patient's clinical outcome following the implementation of IHS into routine clinical care, which may ultimately serve as a model for all hospital services.

## 2. Materials and methods

A multidisciplinary team of integrative healing professionals was assembled to treat patients on the neurosurgery service with post-surgical pain, stress or depression, and/or patients who were intolerant to or failed physical or occupational therapy from June 2016 to February 2017. IHS was only offered to neurosurgery inpatients during this study period. All patients included in this study had extended hospital stays lasting four days or longer, and were resistant to traditional medical or physical therapeutic interventions (e.g. routine pain medications such as opioids and muscle relaxants were insufficient for pain control). All patients were adults over 18 years of age, and had Glasgow Outcome Scale scores of 4 or higher (i.e. all patients had moderate disability but were independent and able to work in a sheltered setting). Patients were identified daily during neurosurgery morning huddle. The huddle team includes a neurosurgery attending, resident, case manager, and physical/occupational therapy representative and this was performed as part of daily patient care. Since IHS intervention was incorporated into the treatment plan of each patient as part of their clinical care, patient consent was not required. IRB approval was obtained to retrospectively review the charts of patients included in this study in order to extract relevant data.

The team-members consisted of acupuncture, healing touch, music therapy, pet therapy, and counseling. The IHS team consists of members from the departments of Integrative Medicine, Center for Stress and Health, Pain Management, Music, and Psychiatry, as well as the Family Health Center. A schedule for each service through the week was created (Table 1). Patients completed a baseline Measure Yourself Medical Outcome Profile (MYMOP) questionnaire before and after undergoing treatment by the IHS. The MYMOP questionnaire is a well validated assay for comparing pre/post-treatment symptom control from a variety of interventions [9]. Data abstraction was completed by one of the authors who was not part of the IHS team. Data was gathered from physical and occupational therapy notes before and after offering the service.

In total, 17 patients received IHS intervention, and the charts of these patients were retrospectively reviewed. An additional 17 patients meeting the same selection criteria as the experimental group who received routine care after the study period were included as controls. The 17 control patients were age and gender matched, and matched the experimental group with respect to pathology type, surgery location (e.g. cranial or spinal)

and type, and preoperative narcotic use. Chaplain services were available to all patients during the study period.

The cost of the integrative healing services was estimated based on each service cost to the number of patients who received IHS intervention (17 patients), Acupuncture professional service costs 100 US dollars per hour and healing professional service costs 60 US dollars per hour. Music therapy and pet therapy had no cost and were performed by members approved by department of volunteer health services. Counseling was offered by the hospital social services.

The charts of patients receiving IHS intervention and age-matched patients receiving routine care were retrospectively examined. Demographic and clinical variables (e.g. pain medication consumption, pain scores, mobility, independence level, and level of assistance with physiotherapy) were extracted before and after IHS intervention until the date of discharge. The primary outcome variables consisted of pain medication consumption, patient reported subjective pain levels, mobility, level of assistance, independence from physical therapy (PT), and increased PT participation. Pain medication consumption was assessed by retrospectively examining the prescribed pain medications and quantifying the type of pain medication and the dose. Verbal reports were obtained from patients regarding their subjective pain based on the Wong-Baker Faces Pain Rating Scale. Mobility was assessed by retrospective examination of the patient's ability to ambulate without assistance. Independence from PT and increased PT participation were determined via retrospective examination of the PT chart notes. Statistical analysis was conducted with a paired samples *t*-test to determine whether specific clinical outcome variables significantly differed between the routine care and IHS groups, as well as IHS subgroups. An independent samples *t*-test was used to determine if there was a difference in the mean demographic and primary outcome variables between routine care and IHS groups, as well as between IHS subgroups. Statistical analysis was performed using PASW Statistics 18.0 software (SPSS Inc., Chicago, IL). A *p* value of <0.05 was considered statistically significant.

### 3. Results

A total of 34 charts were retrospectively reviewed, with 17 patients receiving IHS (11 cranial and 6 spine cases), and 17 patients receiving routine care (11 cranial and 6 spine patients) (Table 2). The average age across all patients was 51.6 (range 24–88), with cranial patients averaging 55.1 years (range 24–88) and spine patients averaging 45.3 (range 33–60); both groups did not statistically differ in age. In the routine care group, the average age was 57.5 (range 20–85), 54.5 (range 20–85) in the cranial group, and 60.5 (range 22–80) in the spine group. The combined IHS and routine care groups did not statistically significantly differ in age.

In the IHS group, 71% (12/17) of patients had a reduction in pain medication consumption, with 55% (6/11) of cranial and 100% (6/6) of spine patients reporting a reduction in pain medication consumption when compared to baseline (Table 2). Once initiated, IHS treatment was provided to all 17 patients for the entire length of their hospital stay (8.6 days on average following initiation of IHS treatment). The average pain scale score prior to treatment was

5.5 out of 10 across all patients, while the average pain scale score following treatment was 3 out of 10 across all patients ( $p<0.01$ ). There was also a statistically significant decrease in the post-pain scale score within groups, with a decrease from 5.3 to 3.3 in the cranial group ( $p<0.05$ ), and 5.8 to 2.5 in the spine group ( $p<0.05$ ). The average decrease in the pain scale score was 2.5 points total, with an average decrease of 2 in the cranial group and 3.3 points in the spine group (Table 2) ( $p<0.05$  in all groups).

In the IHS group, 59% of patients reported improved mobility, with 55% of the cranial and 67% of the spine group improving in mobility (Table 2). There was a statistically significant difference in pre- vs. post-levels of assistance across all patients when compared to baseline (Table 2) ( $p<0.05$ ), but no statistically significant difference when comparing either the cranial or spine group individually. The average decrease in the post-level of assistance is 15% across all patients ( $p<0.05$ ), and 11% and 21% in the cranial and spine groups, respectively. 65% of all patients, 64% of cranial, and 67% of spine patients demonstrated improved independence levels with physical therapy (Table 2).

The cost of services offered to the 17 patients in the IHS group was estimated to be 2720 US Dollars as Acupuncture professional service costs 100 US dollars per hour and healing professional service costs 60 US dollars per hour, Music therapy, pet therapy and Counseling free, 65% of patients requested revisit with a cost of \$1768 with total cost of \$4488. There was no additional cost incurred to support members of the neurosurgery team involved in the daily discharge huddle.

The average length of stay in the IHS group was 12.6days (range 4–40), with the cranial group averaging 14.7days (range 4–40), and the spine group averaging 8.7days (range 5–17). The routine care group length of stay was 19.6days on average (range 5–45), 19.3 (range 11–37) days in the cranial group, and 20.3days (range 5–45). When comparing the average length of stay between the two groups, the IHS group had significantly shorter stays than those in the routine care group (Fig. 1) ( $p=0.01$ ). The spine patients in the IHS group had significantly shorter stays than spine patients in the routine care group ( $p=0.02$ ), while cranial patients in both groups did not have significantly different lengths of stays. The average number of days from therapy to discharge was 4.4days in all patients, with a 65% decrease in length of stay. 29% of patients were discharged to an acute rehabilitation facility (ARU), 59% were discharged home, and 12% were discharged to a skilled nursing facility (SNF).

## 4. Discussion

### 4.1. Key results

This novel IHS treatment team was dedicated to improving the experiences of neurosurgery patients. Treatment approaches were tailored to each patient and could include relaxation, healing touch, music therapy, pet therapy, acupuncture, meditation and counseling. Comprehensive treatment approaches were offered to any neurosurgery patient dissatisfied or distressed during their hospitalization with a length of stay  $>4$ days. This dissatisfaction may be related to ineffective pain control, depression, stress or any other cause of discomfort

or patient intolerance or failure of physical therapy due to any of previously mentioned causes.

#### 4.2. Interpretation and generalizability

Neurosurgical patients are oftentimes in a severely compromised state, and even following an excellent clinical intervention with no complications or residual side effects, neurosurgical conditions can still be debilitating and severely influence that patient's livelihood in a deleterious manner. In addition to pain management, holistic and comprehensive management of inpatients has been demonstrated to improve patient outcome on a variety of self-reported measures, and importantly, improve patient satisfaction with their hospitalization [10,11]. This preliminary study demonstrates the IHS may improve the healing process of neurosurgery inpatients, increasing satisfaction, and decreasing hospital stay. Furthermore, this IHS model can be expanded to other services that cooperatively work with integrative health care providers, and can positively impact the overall hospital patient evaluation.

Although the exact physiological mechanism underlying the effects of such novel interventions remain unclear, they likely are multifactorial in nature and may involve cognitive refocusing on external stimuli that can reduce the focus on pain and modulate their perception of their current hospitalized state. Pain medication consumption is an indirect assessment of the patient's perception of pain during their hospitalization, and is something that is directly assessed by the HCAHPS score; as such, a decrease in pain medication usage is a valuable metric that warrants further investigation and may directly relate to increased satisfaction scores.

We attempted to assess the cost benefit of this study by reviewing the average cost of stay per night for state/local government hospitals in California, which was \$2680, \$3500 in non-profit hospitals, and \$2140 in for-profit hospitals [12]. The cost of IHS services offered to our 17 patients in the IHS group was estimated to be 2720 US Dollars per patient, in addition to the \$1768 cost of a revisit, which was requested by 65% of patients for a total cost of 4488 US dollars. The average length of stay in the IHS group was 12.6days and 19.8days in the routine care group, which results in a 7.2-day decrease (36.3%) in the average length of stay between the groups and a \$19,296 decrease in hospital costs (7.2days multiplied by \$2680). This suggests that by introducing integrative healing services into clinical practice, there is a possibility that the overall cost of the hospital stay may decrease and patient satisfaction will positively affect hospital ranking and reimbursement. Ultimately, incorporating cost saving practices coupled with measures that increase patient satisfaction will help improve the value of care delivered to patients.

#### 4.3. Limitations

Although great care was taken to ensure the validity and accuracy of this study, a number of limitations exist. A primary limitation of our study is that the control group that received routine care was age matched, but not pathology matched with the experimental group (beyond grouping into spinal vs. cranial pathologies). Furthermore, the patients who received IHS services were offered the services only during the study period, and the control

group consisted of patients who were not offered IHS services and received routine caring after the time that IHS services had been available. Additionally, the widespread applications of IHS in the neurosurgical service requires a substantial amount of up-front organizational, administrative, and financial investment in order to build and sustain a team to provide IHS interventions to in-patients. However, the long-term increases in patient satisfaction and subsequent benefits to the institution, in the authors opinion, outweigh these entry costs. Of note, the cranial and spine IHS patients differed in average age, although not statistically significant, this difference may have affected outcomes between these two groups. Due to the retrospective nature of this study, it is difficult to assess the exact utility of the IHS intervention itself, and it is entirely possible that simply spending more time with patients would yield similar results. Although we concede that the exact etiology underlying the improvements we describe in this study should be investigated further in a prospective randomized trial, there are nonetheless significant improvements in patient outcomes following IHS intervention. Furthermore, although care was taken to enroll a maximal number of patients, due to the nature of the study and the time-intensiveness of enrolling each patient and providing individualized IHS, a limited number of patients were enrolled and thus the strength of the conclusions is limited by our sample size. The length of stay of the patients included in this study was relatively long, likely due to pain management challenges that arose during their hospital course. Additional investigation into using the patient's specific pathology and/or pain trigger in order to guide treatment options may further enhance the value of health care delivery. Due to the limited sample size in this study, we were unable to evaluate each of the individual therapy strategies to isolate the effect each had on patients (i.e. the effects of acupuncture alone compared to pet therapy on pain medication usage), although this is an active line of investigation at our institution. Also, this study was limited to offering IHS at hospital day 4, perhaps introducing IHS in the peri-operative period may yield additional benefits. Lastly, this is a retrospective before-and-after study design that inherently does not take into account the natural time-related improvement expected in patients recovering from surgery, particularly since the retrospective nature of the study precluded an untreated comparison group.

## 5. Conclusion

Overall, IHS intervention in the neurosurgery inpatient setting decreased self-reported pain scale scores, enhanced mobility, improved independence levels of patients, and improved patient participation with physical and occupational therapy. Furthermore, these improvements promoted the healing process during the recovery period, and are expected to generate increased HCAHPS scores which will lead to improved hospital ranking and reimbursement. The expansion of IHS to other inpatient services hospital-wide would likely improve many aspects of clinical care and patient outcomes.

## Funding

\$10,000 – Intramural grant from University of California, Irvine Patient Experience division (Inpatient Integrative Healing Services Team Approach on the Neurosurgery Service).

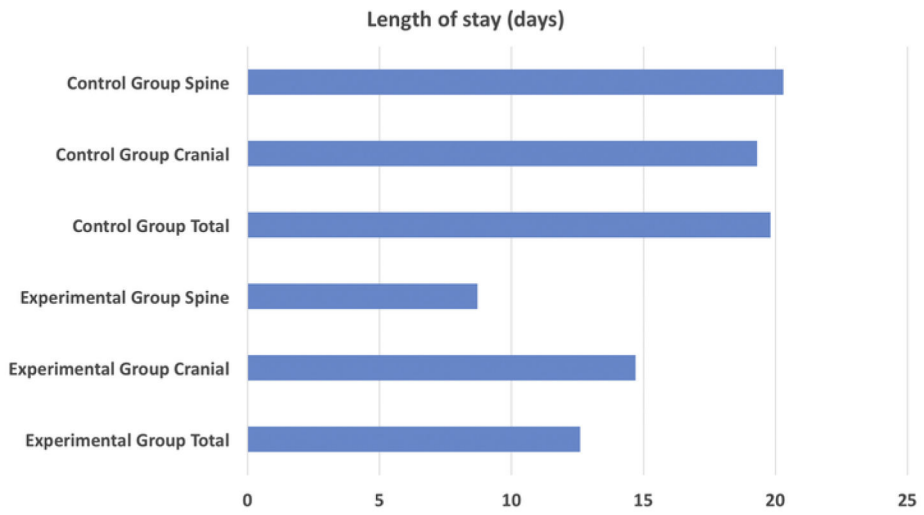


## Abbreviations:

<b>HCAHPS</b>	Hospital Consumer Assessment of Healthcare Provider and Systems
<b>CMS</b>	Centers for Medicare and Medicaid
<b>IHS</b>	Integrative Healing Services
<b>MYMOP</b>	Measure Yourself Medical Outcome Profile

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**Fig. 1.** Graphical depiction of average length of stay in the routine care and IHS groups.

**Table 1**

Tabulation of the various integrative health services provided on a weekly basis.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Acupuncture	X		X				
Healing touch		X		X			
Pet/music therapy and counseling	X	X	X	X	X	X	X

**Table 2**

\*Indicates statistically significant difference across relevant rows. PT=physical therapy; OT=occupational therapy.

	<b>Total</b>	<b>Cranial</b>	<b>Spine</b>
N	17	11	6
Age (range)	51.6 (24–88)	55.1 (24–88)	45.3 (33–60)
Sex male: female (% male)	1.7:1 (59)	1.6:1 (64)	2:1 (50)
Number of patients with decrease in pain medication consumption (%)	12/17 (71)	6/11 (55)	6/6 (100)
Pre-pain scale score	5.5*	5.3*	5.8*
Post-pain scale score	3*	3.3*	2.5*
Number of patients with increased mobility (%)	10/17 (59)	6/11 (55)	4/6 (67)
Pre-level of assistance	59%*	57%	63%
Post-level of assistance	44%*	46%	42%
Average hospital length of stay (days)	12.6	14.7	8.7
Discharge	ARU (5); Home (10); SNF (2)	ARU (1); Home (8); SNF (2)	ARU (4); Home (2); SNF (0)
Number of patients who were independent from PT (%)	11/17 (65)	7/11 (64)	4/6 (67)
Number of patients with increased PT/OT participation (%)	14/17 (82)	8/11 (73)	6/6 (100)