PILOT PROGRAM TO IMPROVE TRANSFER OF CARE BETWEEN NEUROSURGICAL AND OUTPATIENT NEUROLOGY TEAMS FOLLOWING IMPLANTATION OF AN INTRATHECAL BACLOFEN PUMP

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By

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ABSTRACT

Current clinic procedure in a large urban hospital-based outpatient Neurology practice does not include standardized handoff communications for ITBP patients during transfer or transition of care, specifically between Neurosurgery and Neurology. The paucity of interdisciplinary communication leads to lengthy durations of time between pump implantation and outpatient follow-up, poor continuity of care, and increased potential for avoidable negative events.

A new pilot workflow was developed by the researcher and implemented over a 24 week time frame. Comparison data were obtained via EMR from the same time cycle of the previous year. Metrics evaluated included average days to Neurology clinic follow-up post implantation, frequency of pre-surgical notification, and frequency of post-surgical handoff between Neurosurgical and Neurology team members. Neurology and Neurosurgical team members were asked to complete a pre/post implementation electronic survey to assess changes in perception of teamwork.

Average days to Neurology follow-up post implantation decreased 31.5 days during the pilot study. This was found to be statistically significant with a p-value of 0.03. The incidence of pre-surgical notification to outpatient Neurology increased from 0% to 83.3%. The incidence of post-surgical handoff report increased from 0% to 50%. The average teamwork survey scores showed an insignificant change from a mean of 4.59 to 4.62.

The pilot study aimed to implement a standardized communication workflow in an effort to decrease days to follow-up post-op, increase frequency of patient presurgical notification, increase frequency of post implantation handoff report, and evaluate for change provider interdisciplinary teamwork. Although the data did indicate a decrease in days to follow-up, improved communication and handoff frequency, the pilot workflow is not sustainable. Unanticipated culture barriers and provider time restrictions proved detrimental to the success and feasibility of the project. Changes to the workflow, including collaboration with the Medtronic ITBP representatives and pre-procedure scheduling of outpatient Neurology follow-up appointments could offer realistic and viable alternatives to achieve communication goals.

Dedication

This manuscript is dedicated to the faculty and my wonderful classmates of the first DNP cohort at Georgetown University School of Nursing and Health Sciences. I would not be here without all of your help, love, and encouragement. I would also like to thank my wonderful husband and two daughters for their support and love during this journey.

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Chapter I: Introduction

Healthcare practice and policy in United State, as in other countries, is continually in in the process of reformation. In March 2001, the Institute of Medicine (IOM) released a report entitled, Crossing the Quality Chasm: A New Health System for the 21st Century, which stated that the improvement of the current healthcare system would require major restructuring rather than just simple repairs. The IOM specified that an optimal healthcare system should provide patient care that is safe, effective, patient-centered, timely, efficient, and equitable. In order to meet these new quality standards, the IOM introduced a 'guideline' comprised of ten suggestions for health care system redesign; these were intended to serve as a template of change and restructure for the U.S. healthcare system. Two of these guidelines recommended that medical decision making should be evidence-based and that patient safety should become a systemic, rather than an individual responsibility. (Institute of Medicine (U.S), 2001)

Statement of the problem

Current clinic procedure in a large urban hospital-based Neurology practice does not include standardized handoff communications for intrathecal lioresal pump patients during transfer or transition of care, specifically between Neurosurgery and Neurology. This results in missed patient follow-up visits, missing clinical data, poor continuity of care, and unintended patient hospitalizations for baclofen withdrawal. Aside from increased patient safety, more recent data also suggests that effective patient handoff and interdisciplinary communication has a positive impact on patient satisfaction scores (Lee, Phan, Pronovost, Dorman, & Weaver, 2015). Lower patient satisfaction scores could subsequently have a profound negative impact on outcomes driven reimbursement.

Background/significance of problem

Spasticity is a complicated and debilitating symptom frequently accompanying patients with chronic neurological diseases including Cerebral Palsy, spinal cord injury, stroke, traumatic brain injury, and Multiple Sclerosis. Spasticity is commonly defined in the literature as, "a velocity-dependent increase in the tonic stretch reflex (muscle tone) with exaggerated tendon jerks, clonus, and spasms, resulting from the hyper excitability of the stretch reflex." (Elbasiouny, Moroz, Bakr, & Mushahwar, 2010, p. 23). Oral muscle relaxants and anxiolytics, physical therapy, and Botulinum toxin injections are current first line treatment options. In the event that a patient's spasticity cannot be controlled or improved by conventional oral treatments, or botulinum toxin, implantation of an intrathecal pump may be considered an effective next line therapy. (Saulino, Ivanhoe, McGuire, Ridley, Shilt, & Boster, 2016). Use of the implanted medication pump can often significantly improve patients' spasticity, while decreasing potential medication side effects that are often experienced with oral medications. (Erwin, et al., 2011). Lioresal, commonly known as baclofen is a power antispasmodic that is routinely used in the intrathecal pump. For the remainder of this paper, the medication pump will be referred to as an intrathecal baclofen pump (ITBP).

The ITBP is an implantable medication pump that delivers a continuous dose of baclofen into the intrathecal space of the spine, and is a treatment option for patients who have failed oral therapy or have difficulty tolerating the side effects associated with oral medication. Management of ITBP patient involves coordination of care across many different disciplines, including neurosurgery, neurology, the medical device company, and, if indicated, rehabilitation services. Management of spasticity associated with chronic neurological medical conditions poses many challenges for both patients and providers. The management and treatment of this patient population involves complex care coordination often involving multiple practice disciplines. Many patients have multi-system complaints that require a combination of treatment modalities to address multiple issues including pharmacological agents, rehabilitation services, and multidisciplinary care from other branches of the medical community. Patients with chronic neurological diseases often experience a wide range of symptoms that can only be managed, not cured.

The Joint Commission identifies standardized handover or handoff communication between providers as one of the national patient safety goals. It is reported that nearly 80% of all medical errors involve communication issues during transition of patient care. (Joint Commission, 2012). Communication failure between disciplines can lead to unintended and potentially dangerous negative outcomes for the patient. Managing patients with ITB pumps involves coordination of services across neurosurgery and neurology. Should continuity of care be disrupted or miscommunications occur, the ITBP patient is at increased risk for baclofen withdrawal, which is a medical emergency that can result in severe disability or death. The current communication gap between neurosurgery and neurology invites and necessitates the need for change of practice.

Organizational needs assessment

According to Moran, Burson, and Conrad (2014), "Evaluation of the culture of the organization is critical to not only identifying clinical problems but also to designing and implementing a successful clinical intervention." (2014, p. 154). Prior to identification and selection of an intervention, Schein's Level of Culture Theory was utilized to perform a cultural analysis of the study organization (Schein, 2010). By examining the culture of the organization, the author was able to identify "safety" as integral component of the organizational culture. Not only has the research hospital adopted a culture of safety, but the entire healthcare system has embedded “safety” into the value and mission statements. After assessing the current status of communication and transition of care between neurosurgery and neurology a quality of care gap was identified. The identified gaps in patient care continuity include lack of communication between Neurosurgery and Neurology in regards to scheduling dates and times of ITBP patient surgical procedures, failure of communication or confirmation of successful pump implant, and failure to coordinate outpatient neurology follow-up in a timely fashion. This identified deficit in handover communication flags a potential safety risk for patients, and suggests the need for process improvement. The current ITBP patient workflow delays time between surgery and patient follow-up, does not promote inter-departmental teamwork, and has been a vocalized source of frustration for providers.

Research questions

In post-op adult intrathecal baclofen pump patients, does implementation of a standardized communication workflow between neurosurgery to outpatient neurology team members, in comparison with current practice, impact continuity of patient care and provider communication as evidenced by decreased days to follow-up appointment with outpatient Neurology? Secondary variables to be examined include frequency of presurgical notification from Neurosurgery to Neurology and frequency of post-op handoff report between Neurosurgical and Neurology teams. A tertiary variable to be included in the pilot study will be pre and post intervention Neuroscience stakeholder perceptions of interdepartmental teamwork.

Theoretical framework/EBP model of implementation

An initial step in overcoming potential barriers and successfully implementing changes in clinical practice is to select an appropriate evidenced-based practice (EBP) model to serve as a framework for change. The framework selected for this study was the Iowa Model for EBP, as it is the model currently utilized by the hospital and outpatient practice. The Iowa model provides a strong and easy-to-navigate framework for process improvement. The Iowa model was designed to serve as a mechanism for continual process of improvement after re-evaluation of process change. The model is a multi-step process for change that involves several clearly identified steps and feedback loops, and has been found to be particularly helpful when initiating change amongst multidisciplinary teams (Titler et al., 2001)

The first step of the Iowa model is to identify a 'trigger'. Triggers can either be problem-focused or knowledge-focused (Melnyk & Fineout-Overholt, 2015). The flawed ITBP clinic communication is a problem-focused trigger, as it is a clinical problem and poses risks to patients. The second step in the Iowa model process is the formation of a team. The ITBP clinical process improvement team includes neurosurgeons implanting the medical device, neurology nurse practitioners and physicians managing ITBP patients, the neurosurgery OR scheduler, and the neurosurgery physician assistants. The evidence and research has been gathered and synthesized by the lead investigator, but additional evidence may surface as the project continues to develop. The third step in the Iowa model is to formulate a pilot program, if the evidence supports an intervention. The need to implement a process improvement change was supported by the body of evidence.

Chapter II: Review of Selected Literature

Introduction of search criteria

An online search of CINHAL, Cochrane, Clinical Key, or PubMed using the terms or combinations of "and/or" and combined MESH terms "baclofen pump documentation, ITBP communication, patient handover of baclofen pump care, or ITBP handover, baclofen pump clinic.", yielded no results. The electronic search was expanded to include more generalized terms to include "SBAR technique, handover tools, safety, patient safety, adverse health care event, adverse event, health care error, medical errors, handoff, handover, communication, sign-off, post-op care, post-surgical care, patient handoff, transition in care, and transfer of care", and yielded 6,506 articles. After filtering for inclusion criterion, which included adult populations, English language only, and peer-reviewed journal articles between the years 2000 to 2015, a total of 56 articles met criteria for review. Articles that did not meet the inclusion criterion were not included in the review. Of the 56 titles and abstracts reviewed, 26 articles were reviewed in full, with 10 articles chosen for the literature review and formation of the table of evidence based on their relevance to the topic of handoff communication processes.

Critique and synthesis of previous evidence

Articles selected for review included systematic reviews (n=2) (Abraham, Kannampallil, & Patel, 2014; Hesselink et al., 2012), mixed methods (n=1) (Kessler et al., 2014), RCT (n=1) (Marshall, Harrison, & Flanagan, 2009), qualitative studies (n=1), pilot programs (n=3) (Freitag & Carroll, 2011; Koenig, Maguen, Daley, Cohen, & Seal, 2011; Wentworth, Diggins, & Johnson, 2011), and pre/post prospective qualitative intervention studies (n=2) (Abraham, Kannampallil, Almoosa, Patel, & Patel, 2014; Nagpal et al., 2013). All of the articles reviewed included adult patient populations, while settings varied between general hospital setting (Kessler et al., 2014), progressive care unit (Wentworth et al., 2011), telemetry unit (Freitag & Carroll, 2011), critical care unit (Abraham et al., 2014), post-surgical care unit (Nagpal et al., 2013), outpatient clinics (Koenig et al., 2011), and a Medical school training lab (Marshall et al., 2009). One article included a secondary database, as data was gathered through electronic internal medicine and emergency room physician surveys at ten large teaching hospitals around the United States (Kessler et al., 2014). Sample sizes ranged from n= 10 (Abraham, Kannampallil, Almoosa, Patel, & Patel, 2014) to n=750 (Kessler et al., 2014), with one study not listing number of participants (Freitag & Carroll, 2011).

Interventions described in the articles included communication training and implementation of a standardized communication tool (n=5). Of these five articles, three implemented SBAR (situation, background, assessment, recommendation) technique as the standardized handoff tool (Freitag & Carroll, 2011; Marshall et al., 2009; Wentworth et al., 2011), while the other two studies contrasted HANDIT vs. SBAR (Abraham et al., 2014), and a verbal handover technique (Nagpal et al., 2013). The remaining articles (n=5) did not have a specific intervention, but rather aimed to summarize or describe existing handoff methods and current handoff practice amongst the various healthcare settings (Abraham et al., 2014; Hesselink et al., 2012; Kessler et al., 2014; Koenig et al., 2011; Kripalani et al., 2007).

The three most utilized modes of patient handoff were paper-based, electronic stand alone or web-based tools, and electronic tools embedded in EMR (Abraham et al., 2014). Nearly half of the literature reviewed involved physician to physician handoff tools, while the remaining studies included tools for nurse to nurse and physician to nurse handoff. (Abraham, Kannampallil, & Patel, 2014). Only one study examined communication between multiple healthcare disciplines. (Koenig, Maguen, Daley, Cohen, & Seal, 2011). Seven of the ten articles focused on handoff communication between inpatient hospital units (Freitag & Carroll, 2011) (Kessler et al., 2014; Koenig et al., 2011; Marshall et al., 2009; Nagpal et al., 2013; Wentworth et al., 2011), while two of the articles involved handoff communication between inpatient physicians and outpatient providers at discharge (Hesselink et al., 2012; Kripalani et al., 2007). One of the two systematic reviews did not specify location of handoffs because the main focus or the review was to evaluate modes of handoff tools. (Abraham, Kannampallil, & Patel, 2014).

Reported outcomes included improved communication (Abraham et al., 2014; Marshall et al., 2009; Nagpal et al., 2013; Wentworth et al., 2011), improved patient satisfaction scores and nurse-sensitive outcomes (Freitag & Carroll, 2011), and structure and utilization, or lack of utilization, of standardized handoff communication protocols and tools (Abraham et al., 2014; Hesselink et al., 2012; Kessler et al., 2014; Koenig et al., 2011; Kripalani et al., 2007).

Seven of the ten articles were classified as primary research (Abraham et al., 2014; Freitag & Carroll, 2011) (Koenig et al., 2011; Kripalani et al., 2007; Marshall et al., 2009; Nagpal et al., 2013; Wentworth et al., 2011), while three of the ten articles were classified as evidence syntheses (Abraham et al., 2014) (Hesselink et al., 2012; Kessler et al., 2014). The researcher used the Johns Hopkins Evidence Level and Quality Guide (Dearholt & Dang, 2014, p. 232) to assess the strength of evidence reported in the articles. Based on this assessment, the strength of the evidence gathered from the data ranged from Level I to Level IV, with the majority of the articles being level III. The systematic reviews (n=2) provided the highest quality of evidence with an A rating for one (Hesselink et al., 2012) and B rating for the second (Abraham et al., 2014), as it did not included strictly randomized controlled trials. The remaining articles were B (n=4) and C (n=4) when graded for quality of evidence. Two of the articles were authored by several of the same researchers (Abraham et al., 2014; Abraham et al., 2014). This could either be viewed as a source of bias or a confirmation of expertise on the content matter. The situation, background, assessment, and recommendation (SBAR) communication model is mentioned most frequently in the literature (Freitag & Carroll, 2011; Marshall et al., 2009; Wentworth et al., 2011), and may be a feasible tool to utilize while implementing practice change. Multiple studies failed to utilize reliable and valid measures, and had very small sample sizes. These factors contribute to lower evidence quality ratings, which impacts the overall validity of the synthesized evidence.

Due to the wide variation in study design, interventions, strength of data, and variability of reliability and validity among the literature, it is difficult to form one clear synthesis of evidence on which to base a recommendation for a practice change. A majority of the research articles reviewed support a standardized handoff communication when patient care is transitioned or transferred to another provider. However, all ten of the studies echo a similar theme. That is, a standardized method of communication is a crucial component of patient safety and continuity of care.

Rationale for project

The 2007 Quality and Safety Education for Nurses (QESN) project, funded by the Robert Wood Johnson Foundation, identified understanding and utilization of evidence-based practice as a core-nursing competency. (Dearholt & Dang, 2014, p. 4) The current practice or protocol being followed with transfer of care of ITBP patients between neurosurgery and outpatient neurology does not currently incorporate a standardized handoff protocol, as recommended by the body of evidence. Patients who receive an implanted medical device are often not followed in the outpatient neurology baclofen clinic in a timely fashion due to a insufficient communication between the two departments. Often, the outpatient neurology team is unaware that a patient has received an ITBP until several months after implantation. This disrupts continuity of patient care and poses a safety risk for patients.

The current literature supports a standardized handoff tool or protocol can greatly improve communication between providers. This improved communication positively affect patient quality of care, continuity of care, and patient safety citation. Implementing a practice change, supported by the literature, is needed in the current situation, to minimize risk of negative patient outcomes, improve continuity of patient care, and improve interdisciplinary collaboration and teamwork.

Institution of a quality improvement pilot project by implementing a new baclofen patient workflow, inclusive of a standardized handoff protocol when transitioning care of ITBP patients from neurosurgery to outpatient neurology is supported by the body of evidence. Resistance can occur with any process improvement or practice change. Using a change model assists in barrier and facilitator identification. The researcher chose to use Lewin's Change Theory (1951) for this study; this theory provides a framework for change that serves as a theoretical foundation for institution of the new communication process. Lewin's change theory includes three distinct steps: unfreeze, change, and refreeze (Lewin, 1951), defined as: discontinuation of current practice (unfreeze), implementation of pilot process (change), and finally ensuring that the new process continues to become the new standard by performing quarterly chart audits, and reviewing ITBP patient status during weekly team meetings (refreeze).

Barriers to success may include lack of buy-in or agreement regarding urgency of needed change, difficulty in coordinating several practice areas (inpatient neurosurgery and outpatient neurology) and willingness to ‘slaughter the sacred cow’. A lack of consensus on perceived importance of specific details to include in handoff communication, and the potential difficulty to enforce and monitor use of a standardized communication protocol may hinder the adoption of workflow change. The implementation and success of this change will involve and depend on all of the stakeholders.

A quote by Irish playwright and economist, George Bernard Shaw states, “the single biggest problem in communication is the illusion that it has taken place” (n.d.). Implementing the standardized communication process is necessary to ensure that such a vital component of patient care, patient handoff communication, is consistently and reliably occurring between neurosurgery and neurology providers when transition care of ITBP patients.

Chapter III: Methodology

Design/implementation framework and plan

The researcher developed a quality improvement project designed to establish a standardized workflow to mitigate the potential risk for negative patient outcomes related to ineffective or inconsistent communication during the baclofen insertion process . The interdisciplinary flow of information highlighted in the pilot study began when a potential ITBP candidate was scheduled for implantation with Neurosurgery and culminated with the first follow-up appointment in the outpatient neurology clinic within twenty-one days of hospital discharge. Only Neurology and Neurosurgical stakeholders were included in the pilot workflow.

The pilot quality improvement process is the end result of multiple focus groups and team meetings, involving stakeholder representatives from neurosurgery and neurology, which identified several gaps in continuity of patient care between the two disciplines. The identified gaps in patient care continuity included lack of communication between Neurosurgery and Neurology in regards to scheduled dates and times of ITBP patient surgical cases, failure of communication or confirmation of successful pump implantation, and failure to coordinate outpatient neurology follow-up in a timely fashion. The pilot process improvement plan aimed to standardize current communication modalities, strengthen interdisciplinary relationships, and establish best communication practices

Human subject review

This quality improvement initiative was submitted to IRB for review and approved February 6, 2016. IRB approval #2015-0724.

Population

The pilot program involved collection of information from ITBP subject EMR and survey results from Neuroscience stakeholders. The ITBP population in the study included all identified ITBP patients, aged 18 and older, who were undergoing surgical implantation and/or revision of ITBP or spinal catheter at the research facility. Only ITBP patients whose medication pumps were managed by the Outpatient Neurology team were included in the data collection. Patients under the age of 18, and those whose pumps were implanted at the research facility, but were managed by outside physicians, were excluded from the data collection. The specific ITBP subjects were selected based on meeting the inclusion criteria described above. Demographic data was collected from subjects who received an ITBP implantation or revision during the data collection timeframe. Frequency of presurgical notification and handoff report of included ITBP subjects was notated during data collection period. Comparator demographic data was retrieved from EMR during same time frame of previous calendar year. Comparator ITBP subjects included in the data analysis met all inclusion criteria above. Per IRB, the need for ITBP subject consent was not required. The waiver was granted by the IRB because this was a quality improvement project and because the researcher already had permission for chart review in EMR due to established care of subjects.

In addition, 18 Neurosurgery and Neurology providers and administrator stakeholders who were directly involved in the care and coordination of ITBP patients were invited via e-mail to participate in the pre and post intervention surveys. This group included 1 Neurosurgeon, 3 Neurosurgical PAs, 2 Neurosurgery administrators, 3 Neurology administrators, 4 Neurologists, 4 Neurology NP’s, 1 Neurology RN. These stakeholders were selected based on their participation and involvement in ITBP patient coordination and care, and for their role in the

ITBP workflow. Prior to administration of the pre-intervention survey, an email with attached IRB HIPAA waiver was sent to all invited Neuroscience stakeholders (See appendices D and E for copy of email and IRB waiver).

Intervention

The intervention included the establishment of a standardized handoff process for ITBP patients. The SBAR technique for communication handoff is the standard of care within the study facility and will be incorporated into the ITBP handoff process. Once a standardized process was developed and piloted, the outcomes were evaluated for evidence of feasibility and success.

Prior to the initiation of the pilot study, all provider stakeholders completed a 5 question survey, via Survey Monkey, as a means to establish a baseline "teamwork" score. The pilot program consisted of a new patient workflow, which was initiated with a Neurology referral for an ITBP placement or revision. (See appendices B and C for Pre and Post intervention workflows). Following referral to Neurosurgery for evaluation and examination, the neurosurgery scheduler communicated the proposed surgery date via e-mail to the neurology team. During weekly neurology team meetings, proposed surgical dates were discussed and a neurology nurse practitioner was assigned to follow the patient through the implantation and clinic follow-up process. The SBAR technique (Situation, Background, Assessment, and Recommendation) for communication handoff is standard of care within the study facility and was be included in the ITBP handoff process. Once surgery was successfully completed, the Neurosurgery team member (neurosurgeon or physician assistant) contacted the neurology nurse practitioner clinic as instructed in new post-op order set write-in instructions. An SBAR inclusive report of ITBP status was exchanged between the neurosurgery team member and the assigned nurse practitioner. This 'live' communication, in SBAR format, served as the clinical handoff of care between Neurosurgery and Neurology, and was documented as a phone or clinic note in the ITBP subject's electronic medical record by the receiving Nurse Practitioner. Once handoff communication occurred, the neurology nurse practitioner rounded on ITBP subject in the post-anesthetic care unit (PACU) or inpatient hospital room. The ITBP pump was interrogated and the subject was provided with a return to clinic date, based on the pump alarm dates. The ITBP telemetry, which includes detail of patient's pump including model number, pump volume, current rate, and date of low reservoir alarm, was scanned into patient's chart upon return to the outpatient neurology clinic. The provider perceptions were evaluated with a pre/post survey administered to all stakeholders prior to and after intervention.

Once a standardized process was developed and piloted, the outcomes were be evaluated for evidence of feasibility, achievement of goals, and sustainability. Measured outcomes included change in average days to follow-up appointment with outpatient Neurology, frequency of notification from neurosurgery scheduler to neurology team regarding upcoming ITBP surgical cases, frequency of SBAR format verbal handoff from neurosurgery team to neurology nurse practitioner after successful surgical procedure, and change in provider perceptions of interdepartmental teamwork.

Instruments/tools/validity and reliability

The instrument used to capture Neuroscience stakeholder perceptions was a 5 question Survey Monkey questionnaire. (See appendix A). The secure, anonymous, online survey was adapted and condensed from a 75-item assessment called the Practice Environment Checklist (PEC) via cronbach alpha, repeated testing and validation. The 5-question survey was developed by Stephen Lurie, Stephen Schultz and Gina Lamanna from University of Rochester, Department of Family Medicine in an effort to create a user-friendly condensed tool to measure views of team effectiveness. Request for permission to use the validated tool was sent via e-mail to Dr. Stephen Lurie. Per Dr. Lurie, no permission was deemed necessary to reproduce and utilize the survey in this project. (S. Lurie, personal communication, November 21, 2015) The 5-question survey was copied and pasted into a Survey Monkey document for electronic distribution to project stakeholders prior and post implementation of pilot workflow. The team survey consisted of five questions on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). The questions included in the survey were "This team encourages everyone to share ideas", "When people in this team experience a problem, they make a serious effort to figure out what's really going on", "People in this team have the information they need to do their job well", "Leadership in this team creates an environment where things can be accomplished", and "Everyone in the team feels able to act on the team vision". The Survey Monkey results were reviewed and coded on two separate occasions against the original document survey to ensure no errors in transcription occurred.

Procedures/timeline

The data collection period for this pilot study started on week three of the timeline and continued until week 22.The pre-implementation survey and HIPAA waiver was sent via secured e-mail to 18 Neurology and Neurosurgical stakeholders at week one, with replies due by the end of week two. The new quality improvement ITBP patient workflow was implemented on week 3 and lasted until week 22. The post implementation survey was electronically distributed in week 22 with survey returns due by week 24. Data analysis began after week 24.

The ITBP subject data was collected and recorded in an Excel (version 15.21.1) spreadsheet on a rolling basis as cases occurred which was then kept in a locked cabinet within a locked room. Pre-intervention comparator ITBP subject data was obtained via EMR from the same time cycle of the previous year in an attempt to match anticipatory ITBP subject volume and control for any seasonal variations in surgical schedule. All data was manually entered four separate times (for cleaning) into an Excel spreadsheet and saved onto an encrypted flash drive. The data was then analyzed using StatPlus (version 6.0.3) in Excel.

Outcome measurements/data analysis plan

Multiple data sets were collected and analyzed. Demographic data including age, gender, ethnicity, type of pump implantation (new vs. replacement), and diagnosis of ITBP subject, both pre and post intervention, was collected from EMR and tracked on Excel spreadsheet. Metrics analyzed in this study included average days to outpatient Neurology follow-up appointment, frequency of notification from Neurosurgery scheduler to Neurology team of upcoming ITBP surgical cases, and frequency of SBAR format verbal handoff following successful surgical procedure. Neuroscience perceptions of interdepartmental teamwork were collected via a 5-question teamwork survey that was electronically distributed to all 18 identified Neurosurgical and Neurology team stakeholders prior to and after initiation of pilot workflow. Survey data was subsequently coded and entered into an Excel spreadsheet for analysis. All data was both electronically tracked and physically recorded in a dedicated notebook, which was kept in a locked desk, only accessible to the author, to ensure protection and security of data. All electronic data was stored on a password protected, encrypted flash-drive which was kept in a locked draw, within a locked room, only accessible to the researcher. The data was recorded as it was collected to ensure accuracy and limit potential for data entry error.

All data was analyzed using StatPlus in Excel. A two-sample t-test was used to compare values of all metrics pre and post implementation of the pilot process. A two-sample t-test was also used to compare pre and post provider perceptions to determine if the process had any effect on perceptions of teamwork. A paired t-test was initially planned, but due to the anonymity of the survey results, pre and post surveys were not able to be paired for analysis.

Chapter IV: Evaluation Results

Analysis of data

Pre and post pilot implementation ITBP patient data was collected and analyzed to discern any for any changes in average days to follow-up with outpatient Neurology, frequency of pre-surgical notification, frequency of postoperative handoff report, and change in provider teamwork perceptions. The demographic of patients who data was used for pre and post intervention analysis is listed below. There was no demographic information collected on the team members who completed the pre and post intervention survey.

Demographics of ITBP subject data

The pre-implementation ITBP subject data included 6 ITBP cases. Demographics of this population included 3 females (50%) and 3 males (50%), 4 Caucasians (67%), 2 African Americans (33%) and an average age of 50.83 years (range 26 to 68 years). Four patients underwent ITBP replacement (67%), while 2 patients (33%) underwent new ITBP placement. Diagnoses varied from stroke (n=1), cerebral palsy (n=1), spinal cord injury (n=2), Multiple Sclerosis (n=1) and Parkinson's (n=1).

The post-implementation ITBP subject data included 6 cases. Demographics of this population included 4 females (67%) and 2 males (33%), 2 Caucasians (33%), 3 African Americans (50%), and one patient of Hispanic origin (17%). The average age was 40.67 years (range 26 to 62 years). Four patients underwent ITBP replacement (67%), while 2 patients (33%) underwent new ITBP placement. Diagnoses included paraplegia (n=2), cerebral palsy (n=1), and Multiple Sclerosis (n=3).

Summary of Findings/Outcomes

Days to outpatient Neurology follow-up.

The average days to outpatient Neurology follow-up pre-intervention were 58.83 days (range of 30 to 108 days). The average days to outpatient Neurology follow-up post-intervention were 27.33 days (range 4 to 61 days). Comparison between pre-intervention and post intervention days to follow-up showed a decrease of 31.5 days. This was found to be statistically significant with a p-value of 0.03. (See Fig.1)

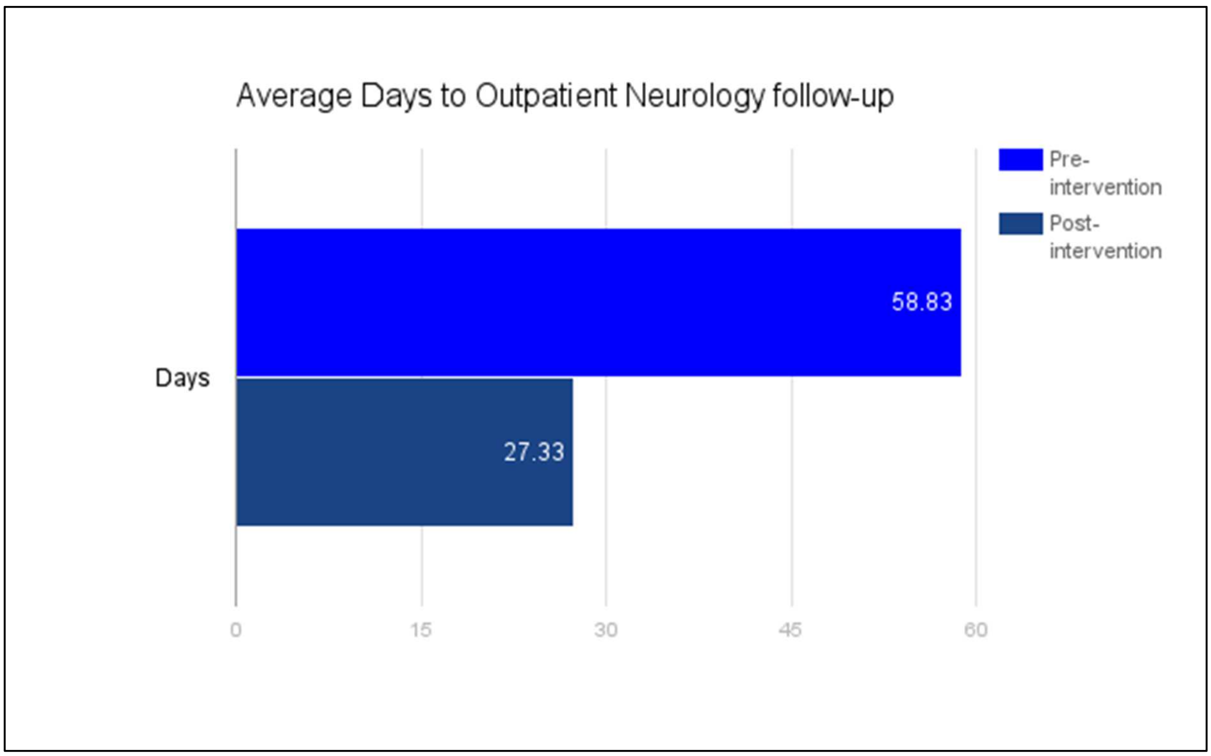


Figure 1: Average days to outpatient Neurology follow-up

Pre-surgical notification.

Neurosurgery pre-surgical notification of impending ITBP patient cases to the outpatient Neurology team was 0% prior to initiation of the pilot workflow. The frequency of pre-surgical notification during the pilot study phase was 83%. The incidence of pre-surgical notification of impending ITBP cases increased from a frequency of 0 out of 6 cases (0%) to 5 out of 6 cases (83.3%).

Handoff reports.

The pre-intervention frequency of postoperative handoff report from Neurosurgery to Outpatient Neurology was 0%. During the pilot workflow phase, the frequency of postoperative handoff report from Neurosurgery to Outpatient Neurology was 50%. The incidence of post-surgical handoff report increased from 0 out of 6 cases to 3 out of 6 cases (50%).

Provider teamwork survey.

The pre-intervention provider teamwork survey resulted in the following values. (See Fig. 2) For question #1, "This team encourages everyone to share ideas", the average score was 4.63. For question #2, "When people in this team experience a problem, they make a serious effort to figure out what's really going on", the average score was 4.5. For question #3, "People in this team have the information they need to do their job well", the average score was 4.44. For question #4, Leadership in this team creates an environment where things can be accomplished", the average score was 4.88. For question #5, "Everyone in the team feels able to act on the team vision", the average pre-intervention score was 4.5.

The post-intervention provider teamwork survey resulted in the following values. (See Fig. 2). For question #1, "This team encourages everyone to share ideas", the average post-intervention score was 4.77. For question #2, "When people in this team experience a problem, they make a serious effort to figure out what's really going on", the average score was 4.77. For question #3, "People in this team have the information they need to do their job well", the average score was 4.31. For question #4, Leadership in this team creates an environment where things can be accomplished", the average score was 4.62. For question #5, "Everyone in the team feels able to act on the team vision", the average post-intervention score was 4.62.

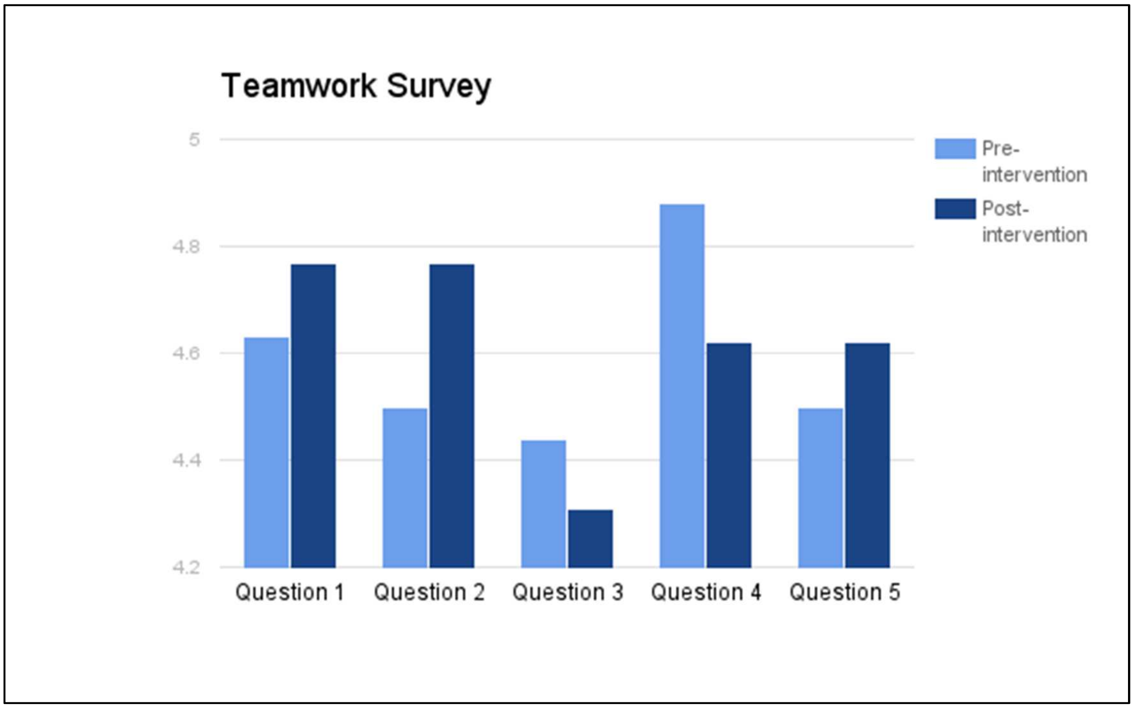


Figure 2: Teamwork survey

There was some variation in difference between individual survey questions. (See Fig. 2). Questions #1, #2, and #5 had an increased score of 0.14, 0.27, and 0.12 respectively. In contrast, questions #3 and #4 had a decrease in score of -0.13 and -0.28. The overall average teamwork survey scores increased from a mean of 4.59 to 4.62, which represented a 0.03% increase. This was not statistically significant with a p-value of 0.407.

Chapter V: Discussion and Conclusions

Discussion of Findings

The data suggests that the pilot workflow did decrease the average days to outpatient Neurology follow-up. It might be possible that the decrease in average follow-up days was related. in part to the increased frequency of pre-surgical notification. The 83.3% increase in pre-surgical notification which appears to be a robust increase, may be skewed by the lack of any notification prior to implementation of the pilot study. In other words, when starting with 0%, it is quite possible that even a small increase in the notification frequency may appear to have a bigger effect. The same principle holds true for the 50% increase in post-surgical report handoff communication. With the pre-intervention frequency of 0% coupled with the small cohort size, a significant increase in frequency may be unfairly skewed. It is also noteworthy to mention that the 3 occurrences of successful post-implantation report occurred with the first three surgical cases. The latter 3 cases did not result in post-surgical report. This might suggest that the pilot was initially successful, but was not sustained in later cases.

The teamwork survey results surprisingly showed little change between the pre and post pilot implementation. Interestingly, two questions (#3 and #4) on the teamwork survey showed a decrease in score post intervention. This is representative of a decreased sense “People in this team have the information they need to do their job well” and “Leadership in this team creates an environment where things can be accomplished”. It should be noted that the response rate for the pre-survey included 16 out of 18 response (an 88% response rate), while the post-survey only captured 13 out of 18 response (a 72% response rate). The true difference between response to survey pre and post implementation may have affected any potential for statistically significant results.

Limitations

There are several identified limitations in this pilot study that need to be discussed and addressed. The first limitation is the exclusion of Neuroscience provider and administrator demographic data. Although the ITBP patient population was the target end population, inclusion of the provider data may have been helpful to better describe the stakeholder population.

A second limitation of the pilot study was the inability to obtain a standard printed order set for post-surgical notification. The current process for altering institutional forms requires submission to a forms committee for review. Due to the limited time frame, this was not able to occur. Changes to the post-op ITBP patient workflow, specifically the handoff communication between Neurosurgery and Outpatient Neurology teams only occurred if the Neurosurgery team remembered the additional step. This may explain the drop-off in handoff communication towards the end of the data collection period.

A third limitation is that anonymity of the e-mail survey did not allow for paired analysis of the data. This may have been helpful to discern specific individuals who reported a change in teamwork perception. This restricts the usefulness of the survey findings.

A final noteworthy limitation is the failure to fully include several key stakeholders in key components of the workflow. Both the PACU nurses and Medtronic representatives play a major role in the care of the ITBP subjects. Failure to include these groups in the teamwork survey and allow for proper representation (e.g. PACU charge nurse) in the planning and execution of the pilot workflow could have helped to drive the project, may have improved PACU stakeholder buy-in, and mitigated any institutional culture barriers.

Some unintended roadblocks included the unanticipated culture clash between medical care units. When performing the duties included in the new pilot workflow, the Neurology Nurse

Practitioners encountered some unanticipated antipathy from the PACU nurses. The Neurology Nurse Practitioners were viewed as outsiders and were questioned repeatedly about their presence at the patient's bedside. Another unintended culture clash occurred between the Neurosurgery Physicians Assistants (PAs) and the Neurology Nurse Practitioners (NPs). The initial design of the post-op communication was intended to take place between the Neurosurgery PAs and Neurology NPs. At the beginning of the pilot implementation, the post-surgical hand-off report came directly from the Neurosurgeon who was a champion of the project. The Neurosurgery PAs were never active participants in the new patient flow, which may indicate either lack of interest in the project or lack of understanding about the new workflow. It may be possible that the PAs were either unclear of their specific role in the new workflow, or did not see value or importance in the new handoff communication tool.

Implications for practice, education, research, and policy dissemination

Several factors hindered the long term feasibility and sustainability of the project. There was an underestimation in the time commitment for the Neurology Nurse Practitioners to travel to PACU to interrogate the ITBP and talk with the patient. Extra time was often spent by the Neurology Nurse Practitioners trying to locate and track which post-op phase the patients were located. Not fully understanding and trying to navigate the post-op process was an unexpected challenge and an oversight during project design.

When attempting to implement any kind of change in protocol or process, it is important to remember that any failure can actually be a success. The pilot study helped to identify and begin to address a necessary change to a flawed process, that ultimately has a direct impact on patient care and interdisciplinary teamwork. However, after piloting the new workflow, it became evident that parts of the plan were neither realistic nor sustainable. Requiring the

Neurology Nurse Practitioner to travel to PACU for ITBP interrogation created conflicts with scheduled clinic patients, and consumed more time and energy than anticipated. The availability of a Neurology NP could also not be guaranteed if the OR case ran late or occurred after hours. However frustrating, the roadblocks and barriers provide insight and guidance to improving and reworking the communication workflow.

Recommendations for practice and for further study

The importance of handoff communication is well documented in the literature. Creation of a reliable, sustainable, realistic workflow remains essential to achieve a standardized handoff communication plan between Neurosurgical and Outpatient Neurology teams. The exact mechanism in which to achieve this continues to pose a challenge to both the Neurosurgical and Neurology team members. There has been team discussion of future changes to the workflow. One proposed change would be to submit a permanent addition to the pre-printed order set that would include the Neurosurgery and Neurology postoperative handoff communication requirement. This change would help to ensure that the communication in on the order-set, but does not ensure that the handoff report will occur. This proposal also does not address the cultural challenges in PACU or the time commitment needed from the Neurology Nurse Practitioner.

A second possible alteration to the workflow involves inclusion of the Medtronic pump representative, who is present in the OR at time of insertion and could serve as a viable communication intermediary between the two departments. This change would remove the Neurology NP requirement to go to PACU and replace it with a face to face interaction with the Medtronic representative. The Medtronic representatives are already included on the presurgical notification e-mails sent out by Neurosurgery, so coordination of a post-operative communication plan would be easy to coordinate. This process would allow a handoff communication to occur, would provide exchange of the patient ITBP telemetry, but would not ensure a timely patient follow-up date with outpatient Neurology. It was suggested that the ITBP patients could follow-up with outpatient Neurology on the same day as their standard 2 week Neurosurgical postoperative visit, but this is not possible due to billing conflicts. Another possibility to consistently schedule patients would be to have the Neurology Nurse Practitioner contact the ITBP patient once the pre-surgical notification is received from Neurosurgery. This would ensure that the patient has an outpatient visit scheduled within the 21 day goal after pump implantation.

Although a recent study by Benhem-Hutchins and Heffken (2010), found that interdisciplinary communication is often highly varied and customized between practices with a majority preferring verbal handoff over electronic based report, an opportunity to build-in an electronic communication workflow between departments should be considered. The pilot study institution is currently undergoing a change in the EMR program which offers an opportunity to build a new communication tool embedded directly into the new EMR and accessible to all stakeholders. During the period of the workflow implementation, the outpatient and inpatient facilities utilized different EMR programs which prevented easy access and hindered flow of information. The implementation of a new, confluent EMR system affords an opportunity to create an electronic communication portal that will eliminate some of the barriers created by separate EMR systems. The possibility to create a dynamic "living" document, as utilized at the Cleveland Clinic (F.Bethoux, personal communication, September, 2015) would allow Neurosurgery, Outpatient Neurology, and PACU nurses the ability to have a shared document and communicate in virtual real time.

Although the change process did not ultimately prove sustainable, this pilot study exposed and launched an effort to improve communication between Neurosurgery and Neurology. Unanticipated culture barriers, provider time restrictions, failure to include key stakeholders, and limitations of EMR technology at the pilot facility proved detrimental to the success and feasibility of the project. Restructuring and alteration of the workflow continues to be a priority to the Neurosurgical and Neurology team. Proposed changes to the workflow, including collaboration with the Medtronic ITBP representatives, pre-procedure scheduling of outpatient Neurology follow-up appointments, and creation of a living shared document in the new EMR could offer realistic and viable alternatives to achieve patient continuity and interdisciplinary communication goals.

Appendices

Appendix A: Teamwork survey

Assessing Teamwork Survey

1. This team encourages everyone to share ideas

strongley agree	somewhat agree	neutral	somewhat disagree	strongly diasagree
○	○	○	○	○

2. When people in this team experience a problem, they make a serious effort to figure out what's really going on.

strongly agree	somewhat agree	neutral	somewhat disagree	strongly disagree
○	○	○	○	○

3. People in this team have the information that they need to do their jobs well.

strongly agree	somewhat agree	neutral	somwhat disagree	strongly disagree
○	○	○	○	○

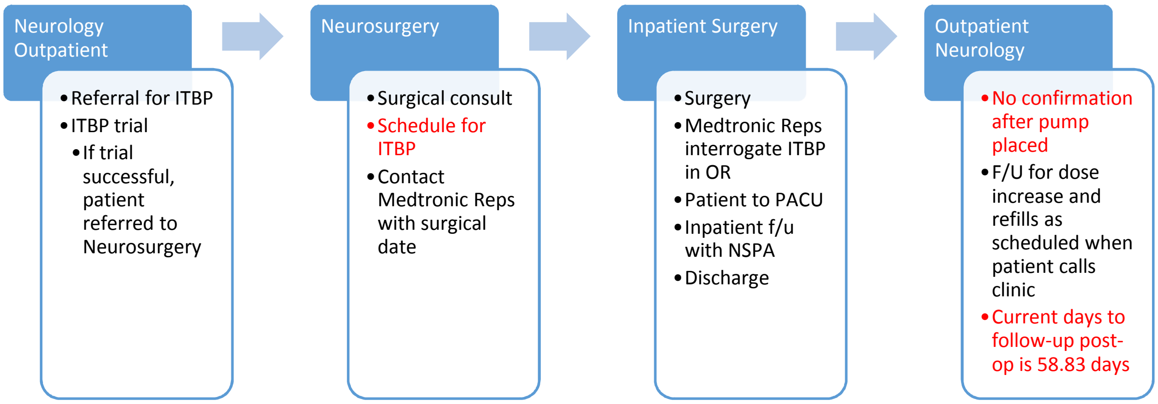
4. Leadership in this team creates an environment where things can be accomplished.

strongly agree	somewhat agree	neutral	somewhat disagree	strongly disagree
○	○	○	○	○

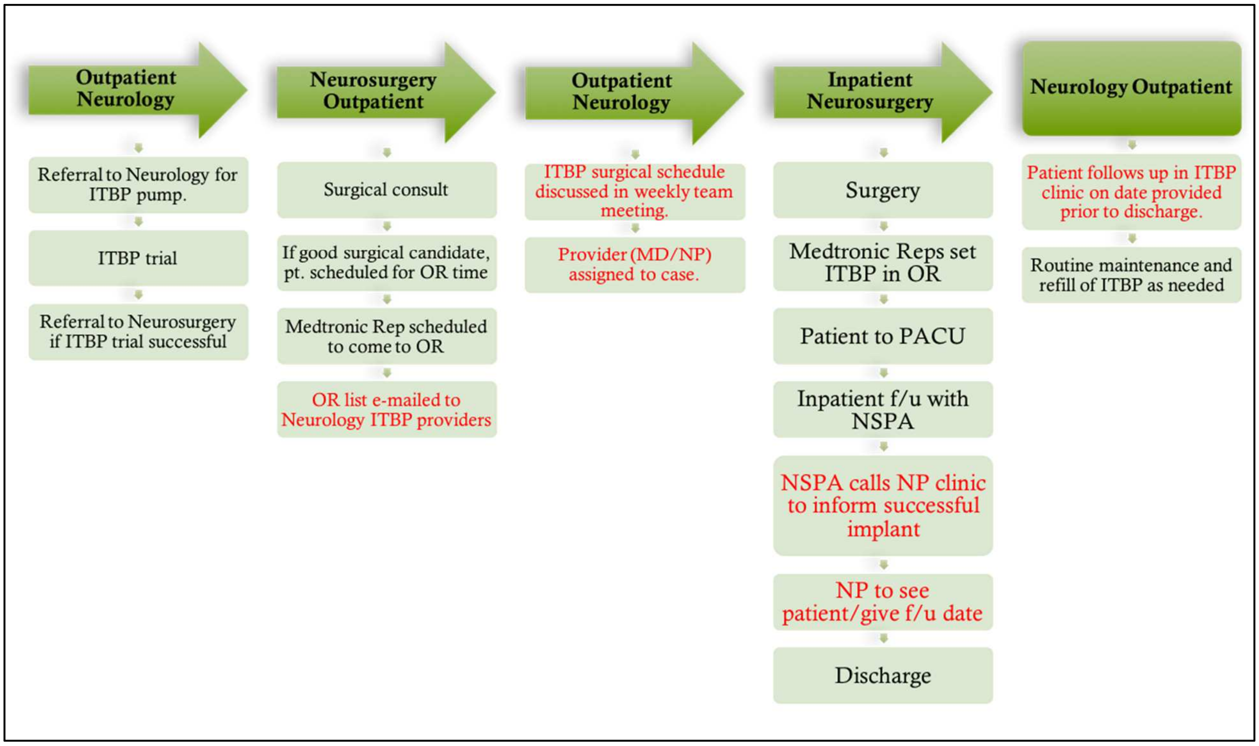
5. Everyone in the team feels able to act on the team vision.

strongly agree	somewhat agree	neutral	somewhat disagree	strongly disagree
○	○	○	○	○

Appendix B: Pre-intervention ITBP workflow



Appendix C: Pilot ITBP workflow



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