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The Johns Hopkins Delirium Consortium: One Model for Collaborating Across Disciplines and Departments for Delirium Prevention and Treatment

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Abstract

Delirium is an important syndrome affecting inpatients in various hospital settings. This article focuses on multidisciplinary and interdepartmental collaboration for advancing efforts in delirium clinical care and research. One model for such collaboration is represented by the Johns Hopkins Delirium Consortium, which includes members from the disciplines of Nursing, Medicine, Rehabilitation Therapy, Psychology, and Pharmacy within the Departments/Divisions of Anesthesiology, Geriatrics, Oncology, Orthopedic Surgery, Psychiatry, Critical Care Medicine, and Physical Medicine and Rehabilitation at both the Johns Hopkins Hospital and Johns Hopkins Bayview Medical Center. This paper describes the process involved in developing functional

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collaboration around delirium, and highlights projects, opportunities, and challenges resulting from them.

Keywords

Delirium care and prevention; inpatient care; interdisciplinary; collaboration

INTRODUCTION

Delirium is an important and common medical problem in many inpatient hospital settings. The risk of delirium is greatest in the elderly, especially in those with pre-existing cognitive impairment such as dementia, as well as severely ill patients and those with organ dysfunction, exposure to toxic medications, brain tumors, or stroke. Post-operative patients are also at high risk for delirium following general anesthesia and major surgical interventions.

Given the large number of at-risk patient groups spanning a variety of inpatient settings, a multi-disciplinary, interdepartmental approach is essential for successful prevention and treatment of delirium. Crucial to this effort are clinicians from multiple disciplines, including Nursing, Medicine, Psychology, Pharmacy and Rehabilitation Sciences, along with key Departments/Divisions such as Anesthesiology, Geriatrics, Oncology, Orthopedic Surgery, Psychiatry, Pulmonary and Critical Care Medicine (PCCM), and Physical Medicine and Rehabilitation (PM&R). Although psychiatrists and psychologists are often considered experts in delirium identification, due to its neuropsychiatric involvement and definition in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM), multi-disciplinary, interdepartmental collaboration is instrumental to achieving "buy-in" for a coherent approach to the management of delirium. Such collaboration also facilitates sharing of discipline and departmental-specific knowledge and expertise. Involving multiple groups allows for prompt case detection, focused diagnostic work-up, and implementation of appropriate interventions to prevent and treat delirium. For example, pharmacists can offer particular insight into the deliriogenic nature of medications, whereas nurses and rehabilitation therapists have unique appreciation for the characteristic fluctuations in mental status from their daily, prolonged periods of direct patient contact.

The Johns Hopkins Delirium Consortium is one model for multidisciplinary and interdepartmental collaboration that spans two hospitals: Johns Hopkins Hospital (JHH) and Johns Hopkins Bayview Medical Center (JHBMC). The objective of this paper is to describe some of the delirium projects that have involved multidisciplinary and interdepartmental collaboration, and how these projects have fostered the development of the Johns Hopkins Delirium Consortium. These collaborations include: 1) delirium measurement and epidemiology, 2) delirium prevention, and 3) investigation of delirium pathophysiology. This paper reviews the objectives, administrative structure, activities, and finances of the Johns Hopkins Delirium Consortium, and discusses the challenges of delirium research.

I. DELIRIUM MEASUREMENT AND EPIDEMIOLOGY

Delirium measurement and epidemiology efforts have focused primarily on delirium screening in two contexts:(1) as part of routine care and quality improvement efforts in both intensive care and non-intensive care settings, and (2) as part of clinical research in the post anesthesia care unit (PACU) and surgical inpatient units.

A. Screening in Intensive Care and Non-intensive Care Settings

The JHH oncology nursing staff identified delirium as an important clinical issue in 2005. With consultation from the psychiatry faculty, oncology nursing instituted routine delirium screening using the Intensive Care Delirium Screening Checklist (ICDSC),[1] which was completed each shift by all nurses in four medical oncology inpatient units at JHH. Subsequently, researchers and clinicians in the Medical Intensive Care Units (MICU) at JHH and JHBMC adopted the Confusion Assessment Method for Intensive Care Unit (CAM-ICU) [2] instrument for routine delirium screening every shift by all nurses on the units. The use of two different delirium screening instruments prompted JHH nursing administration to inquire if a single instrument could be used throughout the hospital.

These circumstances led to the creation of a new collaboration between Psychiatry, Oncology and MICU physicians and nurses. In 2009, this collaboration undertook a quality improvement (QI) initiative focused on delirium screening methods in the medical oncology inpatient population. While the ICDSC and CAM-ICU were validated as delirium screening instruments in ICU patient populations, both instruments had low sensitivity (versus psychiatrists' neuropsychiatric examinations utilizing DSM-IV criteria for delirium) in patients on the lower acuity medical oncology units.[3]

This delirium QI initiative promoted successful collaboration between Oncology, Psychiatry and PCCM departments and between nurses and physicians. Such collaboration developed through weekly meetings in planning, conducting and evaluating the QI project. This evaluation was executed without external funding and was successfully undertaken because the involved groups were highly interested in delirium and answering the underlying question regarding appropriate screening instruments for use outside of the ICU setting. Dissemination of the results of the QI initiative occurred through presentations and academic publications, prompting wider discourse about delirium screening throughout both JHH and JHBMC, and further solidifying collaborations between physicians and nurses in Oncology, Psychiatry and the MICU.

B. Screening After Surgery

The wealth of literature on post-operative delirium stems from scientific interest in the altered mental state commonly following general anesthesia.[4,5] Most investigations start delirium assessment on post-operative day 2. There is relatively little rigorous literature about delirium immediately after surgery and general anesthesia.[5] In an effort to bridge this gap in knowledge, the JMBMC Department of Anesthesiology approached the JHH Psychiatry-MICU team to evaluate the validity of available delirium screening methods through conducting a clinical research study in the Post Anesthesia Care Unit (PACU) and

post-operative inpatient settings at JHBMC. This study was completed in 2010 with data analysis ongoing at the time of this manuscript preparation.

This PACU study created an important collaborative link between the JHH and JHBMC campuses. The idea for this collaboration developed during a dinner meeting supported by the Johns Hopkins Delirium Consortium, featuring an invited guest speaker and attracting attendance of delirium investigators across the institution. This gathering encouraged attendees to briefly review their delirium-related activities with the entire group. The delirium screening work in the oncology inpatient setting conducted by the JHH Psychiatry-MICU team provided an existing infrastructure to undertake related research within the JHBMC PACU setting. Knowledge of this work generated interest in expanding the delirium collaboration, and highlights the importance of creating venues, within an institution, in which delirium activities can be shared.

II. DELIRIUM PREVENTION

A. MICU Delirium Prevention: Reducing Sedation, Immobility and Sleep Deprivation

A program of research, QI, and clinical activities surrounding delirium has been undertaken in the JHH MICU. These activities were initially motivated by NIH-funded, clinical research studies evaluating the long-term physical and mental health outcomes of acute lung injury/ acute respiratory distress syndrome (ALI/ARDS) survivors. This research included daily delirium screening in the study site ICUs,[6,7] and generated valuable local data demonstrating a very high prevalence of delirium, consistent with prior research.[8]

To evaluate the long-term mental health outcomes after critical illness for these studies, PCCM faculty collaborated with Department of Psychiatry faculty. Together these researchers confirmed that Post Traumatic Stress Disorder (PTSD) was common in general ICU survivors[9] and in ALI/ARDS survivors.[7] The traumatic memories recalled by survivors with post-ICU PTSD often included re-experiencing non-existent events (e.g., being imprisoned, raped, and tortured) based on vivid memories of psychotic experiences while delirious in the ICU. Higher doses, and longer durations, of benzodiazepines in the ICU were associated with PTSD symptoms, consistent with the hypothesis that delirium and difficulty processing ICU experiences are risk factors for post-ICU PTSD. This information emphasized the importance of systematic delirium screening and efforts to minimize the prevalence and duration of delirium in the ICU.

Motivated by these research data, an initial QI project was undertaken in the MICU to minimize heavy sedation from benzodiazepine and narcotic infusions and reduce immobility with introduction of early physical rehabilitation. This project resulted in a marked reduction in the prevalence of delirium.[10,11,12] Given a marked increase in the proportion of MICU days without delirium (21% vs. 53%, P=.003),[10] a second QI project utilizing a revised sedation protocol and routine screening for delirium (using the CAM-ICU[8]) followed and demonstrated substantial improvement in over-sedation and delirium. With markedly reduced use of sedation medication in the MICU, sleep deprivation was identified as a further modifiable risk factor for delirium. Consequently, a new QI project and clinical

research study were designed, involving environmental improvements, non-drug therapies, and a pharmacological guideline to promote sleep in critically ill patients.[13]

Collaborators in these various MICU delirium efforts included multiple departments and disciplines, including PCCM MICU, sleep medicine pulmonologists, psychiatrists, PM&R physicians, neuropsychologists, MICU nurses, physical and occupational therapists, respiratory therapists and pharmacists. Success in prior collaborations between MICU and Psychiatry provided the necessary foundation for expansion to the large number of departments and disciplines involved in the MICU QI projects. The MICU physician leader's joint academic appointment in PM&R and PCCM was helpful in establishing linkages, credibility and interest in these MICU delirium projects with the PM&R clinicians and faculty. Weekly and monthly in-person meetings allowed all participants to share ideas and early signs of success which helped generate interest within the group for subsequent projects.

B. Post-Operative Delirium Prevention: Investigating Depth of Sedation in the Operating Room

Current work on delirium in post-operative patients within our institution began with the JHBMC Hip Fracture service in 1998. This collaboration between the Division of Geriatric Medicine and Gerontology and the Department of Orthopedic Surgery strived to encourage early surgery, coordinate care, and decrease post-operative complications, including delirium. While pre- and post-operative management of delirium improved with the ortho-geriatric collaboration, subsequent questions regarding intra-operative factors contributing to delirium stimulated further collaboration between the Department of Anesthesiology and the Department of Psychiatry.

Based on this collaboration at JHBMC, there are now two NIH-funded post-surgical delirium prevention trials. One study includes a single-site, double-blinded clinical trial of elderly patients undergoing spinal anesthesia for hip fracture repair. Preliminary findings from this study demonstrate that lighter sedation is associated with less post-operative delirium.[14] The second study tests the efficacy and safety of dexmedetomidine when given as an adjunct to general anesthesia, and its potential to reduce post-operative delirium in elderly patients. The evolution of this clinical and research work related to delirium, has expanded and strengthened the relationships between departments: Psychiatry provides training and quality control for delirium assessments; Anesthesiology and Orthopedics provide technical expertise regarding interventions to prevent delirium; and Geriatrics provide the expertise regarding medical management of this high risk patient population.

The activity which fostered this collaboration is the formation and maintenance of a hip fracture database that, over a 13-year period, was used to demonstrate continued improvements in patient care[15] and clinical outcomes.[16] The database serves as an important foundation for collaborative delirium work, including conducting observational studies related to delirium epidemiology and interventions, and provision of preliminary data for sample size calculations and grant writing. The database also creates a reason for representatives from the various departments to meet biweekly to review new data and discuss ongoing analyses and future projects. Each member of the collaborative brings their

own unique clinical perspective to enrich the groups' understanding of delirium in these meetings. .

III. PATHOPHYSIOLOGY OF DELIRIUM: INVESTIGATION OF BIOMARKERS

There are few studies evaluating the pathophysiology of delirium. Proposed mechanisms include disruption of the reticular activating system, neuro-inflammation, overlap with Alzheimer's disease mechanisms, and dysregulation of other neurotransmitter systems including acetylcholine, serotonin, and glutamate.[17–24] Studies exploring the role of inflammatory mediators, and beta amyloid measured in the cerebrospinal fluid (CSF), may provide additional biological insights into delirium.

The previously-described collaboration between Orthopedics, Anesthesiology, Geriatrics and Psychiatry provides an ideal opportunity to investigate delirium pathophysiology through a current study evaluating the association of pro-inflammatory markers in the CSF with post-operative delirium in consenting patients undergoing hip repair surgery with spinal anesthesia. This effort was guided by the interests of Geriatrics and Geriatric Psychiatry, by clinician investigators with significant experience in studying the mechanisms of dementing illnesses. Bringing their expertise to bear on the pathophysiology of delirium resulted in the successful award of this grant to a surgeon in the Department of Orthopedics, the principal investigator of this study. This is one example of the potential synergy obtained through collaboration.

This ongoing work in delirium pathophysiology illustrates how interdepartmental collaborations, originally created to respond to the challenges of preventing and treating delirium in clinical practice, can also foster translational research. The sharing of research expertise of the dementia investigators was due to biweekly discourse in the previously described clinical and research meetings, which encourage free exchange about delirium, its etiologic mechanisms, and potential investigative research designs.

IV. BUILDING AND SUSTAINING A DELIRIUM COLLABORATIVE

A. Objectives and Model for the Delirium Consortium

The objective of the Johns Hopkins Delirium Consortium is to bridge disciplinary and departmental silos that can form within a large multi-campus academic institution, in order to increase the free exchange of ideas about delirium and a consistent approach to its management. By sharing unique perspectives in delirium clinical and research work, the Consortium synergistically accelerates a comprehensive understanding of delirium. This model of collaboration was formalized in 2010 and patterned after the Johns Hopkins Dementia Consortium, established in 2002, which resulted in extensive collaboration around dementia research with over 10 new research grants, an annual conference and retreat, and an ongoing Center Grant Award.

B. Administrative Structure and Participation

Leadership is required to gather together diverse researchers and clinicians interested in delirium projects. A leader, who consistently and conscientiously includes multiple

disciplines and departments and reaches out to each of them, is required to create and sustain the Consortium. Within the Johns Hopkins Delirium Consortium, this role is undertaken by the psychiatrist who directs the consultation service for the Johns Hopkins Hospital. This clinical position involves day-to-day involvement with the management of delirium across all departments in the hospital, and is a natural "fit" for this Consortium leadership role. This leader is also uniquely networked with most members of the Consortium through her pre-existing involvement in clinical and research projects.

While all departments and disciplines have been invited to join our group, the decision to participate is influenced by several factors, including level of interest, ability to attend during the meeting times, and ongoing relationships with current collaborators. The Consortium has strong representation from the Department of Medicine, including Medical Oncology, Geriatrics, and PCCM/MICU, where the prevalence and burden of delirium are substantial. To date, there is less representation from General Internal Medicine and Departments of Surgery outside of Orthopedics. However, as the Consortium develops, and research on delirium expands, we anticipate increased interest and participation from other departments and disciplines.

Institution-wide interest in delirium projects is fostered by Consortium members' formal and informal interactions with department Chairs, the Dean of the School of Medicine, the President of JHH, and the Board of Trustees of Johns Hopkins University. Delirium is frequently raised in meetings and presentations with each of these groups because it has been presented to the institution as an important patient safety issue which strongly resonates with the priorities of institutional leaders throughout Johns Hopkins.

C. Meetings and Activities

The Johns Hopkins Delirium Consortium is sustained primarily by scheduled monthly lunch conferences which are held simultaneously on two campuses and linked by videoconference. The agenda is set by the Consortium leader after conferring with the larger group and includes presentation of ongoing research, quality improvement projects and clinical activities by groups within the Consortium. As an example, difficult patient management issues regarding agitated delirium in the ICU were raised to the Consortium leader who then organized a comprehensive meeting on the role of dexmedetomidine in treating agitated delirium in ICU patients. In organizing this specific Consortium meeting, efforts were made to ensure attendance of representatives from ICU Nursing, Medicine and Pharmacy, in addition to the regular members of the Consortium. In addition, formal presentations were arranged to review the evidence for use of this medication and structured discussions were moderated in the meeting and in subsequent email communication. With this foundation, a subset of the Consortium developed a guideline for the use and evaluation of this medication in our institution.

The Johns Hopkins Delirium Consortium has undertaken several other activities to foster inter-departmental and inter-disciplinary delirium work. First, it maintains an institutional database of delirium-related projects that is accessible to all members. Second, dinner meetings with an invited outside delirium researcher are organized once or twice yearly to promote networking and development of new research ideas. Third, the Consortium

facilitates communication and discussion of relevant grant opportunities and publications among all potentially interested members via its meetings and email list. Fourth, the Consortium searches for, and discusses difficult patient cases, QI projects, research projects and grant applications. Finally, the Consortium develops robust educational programs and standardized clinical interventions that can be easily delivered and implemented institution-wide through the wide membership of the Consortium.

D. Finances

The Consortium's only required financial support is for the cost of food associated with the monthly lunch meetings and bi-annual dinner meetings. These costs are paid using internal funds from the Department of Psychiatry. Support for meetings, videoconferencing, and communication is provided via existing infrastructure available within the departments of PCCM, Anesthesia, Oncology, and Psychiatry. No additional support is required. Research grants awarded to Consortium members support those individuals who applied for the grants and the larger institution through direct and indirect costs. Grant funding is not directly shared, in any other way, with the Consortium.

E. Challenges for Delirium Research

An ongoing challenge for delirium research is the lack of a dedicated source of research funding. A "delirium" keyword search of the RePorter National Institute of Health funding database (performed 10/16/2010) found 66 active awards supported by 10 different Institutes, with the National Institute of Aging accounting for 44%, and the National Institutes of Nursing Research; Heart, Lung, and Blood; and Mental Health collectively accounting for another 30%, and another six Institutes accounting for the remaining 25%. Despite its high prevalence and associated mortality and morbidity, a search of open NIH *Requests for Applications* found none with "delirium" in the title.

A PubMed search (performed 10/16/2010) of the 50 most recent publications with "delirium" in the title revealed journals with many different foci, including Psychiatry, Oncology, Neurology, Nursing, Anesthesia, Pharmacology, Critical Care, Geriatrics/Gerontology and Surgery. Overall, while the multidisciplinary nature of delirium may allow collaborations to form and generate great intellectual strength, the lack of a "home" presents a challenge to investigators seeking support for studies and selecting journals for publications, and may pose a barrier to the advancement of delirium research.

The Johns Hopkins Delirium Consortium creates a "home" within our institution and allows members who are regularly in contact with each of these research institutes and journals to monitor and share delirium-related grants and publications with the larger group. We believe that the simple and modest financial and administrative resources required to create, and maintain this Consortium model, make it replicable in other settings.

CONCLUSION

The prevention, detection and treatment of delirium will best be accomplished through close collaboration of multiple disciplines and departments within medical institutions. The Johns Hopkins Delirium Consortium is a collaboration model established and cultivated to

synergize the efforts of interested clinicians and researchers sharing a common goal of advancing delirium work. Such collaboration allows for a multi-faceted approach to the challenges of delirium, and will likely be necessary to combat the increasing burden of delirium in an aging patient population.

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Conflict of Interest:

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