TRAUMATIC BRAIN INJURY: AN INTERDISCIPLINARY APPROACH TO HEALTHCARE OVERSIGHT

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By

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Traumatic Brain Injury: An Interdisciplinary Approach to Healthcare Oversight

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Introduction

State licensing boards (SLBs) serve as overseers to protect the interests of the public by ensuring that individuals who operate under a license to practice in a state uphold the standards of their profession. However, resolving complaints regarding unprofessional conduct for conditions that necessitate interdisciplinary care, such as traumatic brain injury (TBI), may necessitate involvement from SLBs of other disciplines who are most qualified to evaluate the appropriateness of care. To date, there is no single pathway to address complaints regarding the interdisciplinary management of TBI as the mechanisms of the injury are complex, often do not address the full spectrum of issues, and can only address the actions of one clinician at a time. The potential creation of a stand-alone, state-level, interdisciplinary TBI-related oversight board comprised of members from six existing TBI-specific Montana SLBs (TBI-SLB) was explored to understand, overcome, and provide a single pathway for complaint resolution in Montana TBI licensure oversight.

Methodology

A mix-method, parallel convergent design was used for the study. Two independent studies were conducted: one qualitative, comprised of interviews (N=26) with two groups of federal-level clinicians and researchers to gauge feasibility of creating a TBI-SLB, and one quantitative, comprised of professional occupation licensure data collected from 2014-2019 Montana Governor’s Professional and Occupational Reports to explore fiscal burden. The results were then analyzed in a third triangulation data integration study through a side-by-side comparison.

Results

Qualitative: Interview response data indicated three primary categories areas of interest after descriptive analysis: (1) Standards, (2) Fiscal Concerns, and (3) Scope/Oversight.

Quantitative: Linear/multivariate regression modeling and descriptive statistics showed that when combined, the proposed TBI-SLB resulted in an overall total increase in revenue and applications to practice specialized medicine and a decrease in the number of complaints.

Triangulation: With the exception of revenue, there was a lack of agreement in all areas of data explored through comparative analysis.

Conclusion

With revenue being the singular data point in agreement, the researcher cannot conclude there is justification for the creation and possible implementation of a TBI-SLB at this time. More focused research is indicated in this area.
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<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<td>CNRM</td>
<td>Center for Neuroscience and Regenerative Medicine</td>
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<tr>
<td>FSMB</td>
<td>Federation of State Medical Boards</td>
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<tr>
<td>IRB</td>
<td>Institutional Review Board</td>
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<tr>
<td>LIMBIC-CENC</td>
<td>Long-Term Impact of Military-Relevant Brain Injury Consortium - Chronic Effects of Neurotrauma Consortium</td>
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<td>MTDLI</td>
<td>Montana Department of Labor and Industry</td>
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<td>NASEM</td>
<td>National Academies of Sciences Engineering and Medicine</td>
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<tr>
<td>PI</td>
<td>principal investigator</td>
</tr>
<tr>
<td>PM&amp;R</td>
<td>physical medicine and rehabilitation physician</td>
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<td>QMT</td>
<td>Quality Management Theory</td>
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<td>SLB</td>
<td>state licensing board</td>
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<td>TBI</td>
<td>traumatic brain injury</td>
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<tr>
<td>TBI-SLB</td>
<td>[proposed] traumatic brain injury state licensing board</td>
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<tr>
<td>UM</td>
<td>University of Montana</td>
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<tr>
<td>VA</td>
<td>Department of Veterans Affairs</td>
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<tr>
<td>VBA</td>
<td>Veterans Benefits Administration</td>
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<td>VHA</td>
<td>Veterans Health Administration</td>
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CHAPTER 1. Introduction

Background

Traumatic brain injury (TBI) is defined as an injury that causes changes or disruptions to normal brain functioning caused by a sudden insult to the brain from an object or force impacting or penetrating the head (Menon et al., 2010). Approximately 70%-80% of TBIs in the United States are a result of motor vehicle accidents and falls (Popescu et al., 2015). TBIs resulting from an explosion and/or blast (to include physical or manual insult) are also a common occurrence among troops during Operation Enduring Freedom and Operation Iraqi Freedom, and as such, has been referred to as the “signature wound” of these wars (Brundage et al., 2015).

Based on severity and clinical presentation, TBIs are classified as mild, moderate, or severe (National Academies of Sciences Engineering and Medicine [NASEM], 2019), with most TBIs classified as mild (Centers for Disease Control and Prevention [CDC], 2015). The initial severity of TBI is used to guide treatment pathways in the acute stages of the injury, however, severity does not necessarily correlate with long-term prognosis; independent of the severity, recovery trajectories, symptom profiles, and outcomes vary significantly across individual patients (Dwyer & Katz, 2018). While some patients who suffer a TBI may experience symptoms that last only a few days, adverse effects can persist for years, if not indefinitely, even in patients with injuries classified as “mild” (McMahon et al., 2014). These persistent symptoms are more frequent with those who have had repetitive head injury (Dams-O’Connor et al., 2013; Manley et al., 2017).

It is estimated that as many as 5.3 million people in the United States are living with a TBI-related disability (CDC, 2015). Adverse effects of TBI can include impairments related to thinking or memory, movement, sensation (e.g., vision, hearing), or emotional functioning (e.g.,
personality changes, depression) that can significantly interfere with interpersonal, social, and occupational functioning (CDC, 2019) and may lead to poor long-term outcomes, including institutional placement (Roozenbeek et al., 2013).

Coordination, treatment, and providing long-term care for TBI survivors can come at great economic cost. Unfortunately, many of these costs relate to the need for complex and coordinated approaches to care that must be tailored to the individual needs of the patient. Because the sequelae from TBI often manifests across multiple clinical spectrums, affecting different organ and sensory systems, interdisciplinary care teams are essential to accurately diagnose, treat, and establish plans of immediate and long-term care (Lew et al., 2006; Scholten et al., 2016). There is evidence that TBI rehabilitations and interventions coordinated and focused through an interdisciplinary lens reduce costs in several areas, including disability compensation as well as costs associated with social and public health programs, rehabilitation, and transportation (Cooney & Carroll, 2016). An interdisciplinary approach also provides improved health outcomes for the patient, reduces social and fiscal burdens, and improves quality of life for the family and the larger community (Cooney & Carroll, 2016).

Statement of the Problem

Responsible for issuing medical licenses, investigating complaints, and authorizing disciplinary actions in cases of professional misconduct, state licensing boards (SLBs) serve as critical overseers to protect the interests of the public by ensuring that individuals who operate under a license to practice in the state uphold the standards of their profession (US Department of Health and Human Services, 2018a; Thompson, 2006). As with any regulatory authority, it is not uncommon for SLBs to have limited resources with respect to staff and funding that can lead to delays in board actions and resultant frustration (Chaudhry et al., 2015).
Resolving complaints of potential unprofessional conduct is especially complicated in matters related to assessing the quality of care for patients with TBI. The heterogeneity of the clinical presentation and manifestation of TBI coupled with the fact that providers from different disciplines are often treating the patient at the same time and often with conflicting views, suggests that resolving conflicts regarding the conduct of one clinician may necessitate involvement from SLBs of other disciplines who can elaborate on the appropriateness (and ethics) of care. Indeed, concerns of survivors and caregivers about access to treatment options, quality of care, and potential unprofessional conduct should be addressed using a single format to include a mutually agreed upon adjudication process (Strasser et al., 2008). To date, there is no single pathway for complaints of unprofessional conduct related to the interdisciplinary management approach of TBI as the mechanisms of the injury are complex, often do not address the full spectrum of complaints, and only address the actions of one clinician at a time. The result of this lack of oversight is an increased burden in useless expenditure of time and resources (Bodenheimer, 2008).

Significance

Because of the diverse disciplines required to manage a TBI patient with multiple symptoms, a significant challenge faced by the interdisciplinary care team is the delivery of comprehensive and coordinated care that is tailored to the needs of the individual patient (Bodenheimer, 2008; Lew et al., 2006; Santopietro et al., 2015). However, such a strategy is not straightforward and often made more complicated by differing of opinions and absence of coordination between specialists and between competing medical systems (Bodenheimer, 2008). Furthermore, many disciplines may be unaccustomed to working together and some may even be resistant to the idea (Shine, 2002). Incongruence or discrepancy among providers and failure to
coordinate care and implement personalized care models and protocols have protracted ill (physical, emotional, and financial) effects not only for the patient and their families, but also on their communities and medical systems (Bodenheimer, 2008; Cope et al., 2005; Lew et al., 2006). The continued fragmentation and lack of coordination of care, uneven distribution of specialized treatment resources, and lack of expertise by providers are major challenges to effective systems approaches to care of persons with TBI (Burke et al., 2020).

Specific to individual providers, it is unlikely that a single provider from a single specialty can properly address all presenting complaints of the TBI patient, particularly those that fall outside the purview of the provider's specialty (Cope et al., 2005). Multiple providers are needed to ensure the needs of the patient are met. Because providers may be unaccustomed (or resistant) to working with other TBI specialists in related fields of synchronized care, and due to constraints within our current healthcare system, such as a lack of patient-centered interdisciplinary management, a clinician may often be tasked to manage all the patient's complaints, even if they lack the professional expertise. In Montana, as with other rural areas, a lack of providers, specialists, and a challenging physical geography compound this problem. In such instances, many providers and physicians will be practicing relevant forms of medicine outside their realms of expertise (Miller, 2011). With this unfortunate reality comes the increased confusion and the potential for these same providers to face disciplinary action for practicing outside the scope of their professional knowledge and licensure.

Concerns of survivors and caregivers about access to treatment options, quality of care, and potential instances of unprofessional conduct should be addressed using a single format to include a mutually agreed upon standard of care (Strasser et al., 2008). The complexity of the injury necessitates establishing and upholding protocols and standards of care across the
spectrum of TBI providers and services at both federal and state levels, particularly among those
tasked with assessing provider-related complaints. For instance, there are single pathways to
rectification, but they are complex, often do not address the full spectrum of issues and can only
address one clinician at a time (and often, only one system). The result is an increased burden in
time and resources, necessitating a streamlined approach. To pursue this approach, several
questions must be explored:

- **What are considered consistent and acceptable standards of care in the realms of TBI
evaluations and professional qualifications of providers charged with conducting these
evaluations and assessments?**

- **Who or what entities are responsible for ensuring that the standards of care and tenets of
licensure are met and upheld by clinicians operating within various and often competing
healthcare systems and how does that manifest in terms of economic expenditure, labor,
and cooperation between various entities? Or should this be the responsibility of the
respective SLB?**

- **When differences of clinical evaluations and opinions by various specialists across or
between both systems arise, how are they adjudicated in a meaningful, streamlined, and
transparent method?**

Multiple policies instituted or changed under the banner of TBI-related medical care must
take into consideration the short and long-term effects with respect to how such policies and/or
changes will influence licensing requirements of SLBs and standards of accepted practice. If not,
the results and outcomes, of varying and separate complaint adjudication processes may be
inconsistent with the goals, objectives and policies and may be at odds with one another resulting in unilateral dysfunction that negatively impacts the system and the individual (Bahl, 1992).

**Innovation**

The creation of an interdisciplinary TBI-related oversight board comprised of members from six existing TBI-specific Montana SLBs (referred to as TBI-SLB) will address several healthcare accountability challenges and has the potential to improve facets of TBI-related oversight and healthcare related concerns in both federal- and state-based healthcare systems, as well as other relevant TBI-related healthcare systems and venues. To this end, the final product of this proposal will be the development and presentation of a novel set of justifications for the creation of one standalone interdisciplinary TBI-centric SLB to be comprised of members as needed from the following six TBI-related specialties to adjudicate TBI-related complaints in Montana: 1) medical examiners, 2) occupational therapy, 3) physical therapy, 4) speech pathology, 5) psychology, and 6) behavioral health.

Based on evidence-based standards and similar constructs such as those used for gubernatorial advisory boards, medical clearance boards, and other existing interdisciplinary entities and practices (described below), the development of justifications for the creation of model of overseeing professional complaints is intended to streamline administrative costs, improve transparency, and create an exchange of interdisciplinary insight and expertise crucial to improving TBI-related practices and procedures that will benefit the larger medical community, as well as survivors, caregivers, and their communities in Montana.
CHAPTER 2. Literature Review

Several examples exist demonstrating the viability of and additional need for interdisciplinary approaches to TBI-related healthcare oversight and advisory systems in both federal and state areas of regulation, across multiple settings, including but not limited to SLBs.

State Licensing Boards

SLBs, also referred to as state medical boards, are intended to offer protection and a path of recourse for patients, providers, and consumers (Landess, 2019) to improve the absence of quality healthcare. SLBs or their equivalent have been in existence and functioning in different capacities since the early 1900s (Landess, 2019). Each SLB is comprised of medical and/or clinical providers who are licensed to practice a specific discipline by and within their respective states. As of the late 1970s, SLBs also include members of the general public. All members of a SLB are appointed and serve at the behest of a sitting state governor (Landess, 2019; Thompson, 2006). Over the years, the primary mission of SLBs have evolved beyond healthcare regulation and have expanded their oversight to include policy enforcement and discipline for medical/clinical practitioners. However, such a shift in evolution also generated questions and concerns regarding the actual power, standards, and authority of the SLBs (Landess, 2019). Frequently addressed was the concern that extending an SLB’s authority to discipline providers for ethical violations or malpractice reflected a deviation from their original charge of improving healthcare (Adams, 2010). By their construct, SLBs receive complaints from numerous sources: patients, the general public, government entities, medical providers, medical organizations, professional groups, and even legal entities (Landess, 2019). With such a diversity of complaints and organizations involved, many in the public have openly wondered what is the underlying mission of an SLB? Is it to discipline providers? Protect providers? Protect certain interests?
Protect patients? Many feel that the lack of a clear mission and the inability to balance disciplinary actions with improving the quality of healthcare and patient safety have hamstrung many SLBs in carrying out their assigned duties in a fair and transparent manner (Mullangi et al., 2021). Interdisciplinary approaches to treatment, as described above, are increasingly recognized as a standard in the delivery of healthcare. However, such an approach can create another level of patient and consumer frustration as it relates to the administrative processes of SLBs, since SLBs, with the exception of medical doctors and doctors of osteopathy, only oversee one singular professional discipline (Steinbrook, 2014). If individuals from two or more professions licensed through different SLBs are involved in a single complaint, which SLB takes precedence (Mullangi et al., 2021)? As an example, if a patient who is receiving care for their TBI from an interdisciplinary care team has a complaint, which SLB should they engage? And should the SLB initially approached in such a scenario focus on the disciplinary concerns addressed by the complainant or should it focus on improving the overall quality of care associated with the complaint?

Increased public scrutiny and growing awareness in advocacy have pushed these questions of concern to the forefront (Landess, 2019). With advances in medical technology and interdisciplinary approaches to healthcare, the need for increased transparency and enhanced protection of consumers with respect to the rigor of the disciplinary process, detection of unethical or incompetent practices, and addressing and improving standards of healthcare could necessitate the revaluation of the current construct, oversight, and mission of SLBs (Thompson, 2006).
Examples of Board Oversight

The following section will briefly describe existing examples under both state and federal “umbrellas” that support the validity and effectiveness for interdisciplinary approaches to TBI oversight, management, and adjudication. Collectively, these examples support the underlying need that this project intends to address: the justification of creating an interdisciplinary SLB oversight committee tasked with assessing and adjudicating complaints specific to the assessment and management of TBI in a theatre of overlapping and often contradictory medical systems.

Federation of State Medical Boards

The Federation of State Medical Boards (FSMB; https://www.fsmb.org/about-fsmb/) serves as a “national voice” for the 71 boards of medicine and osteopathic medicine in the United States. While lacking formal enforcement authority, the FSMB has remained relevant (since its inception in 1912) owing to its dedication of advocacy, research, education, and other initiatives intended to promote and protect healthcare and regulatory best practice (Scholten et al., 2017). Important principles fostered by the FSMB are collaboration and transparency. Both physicians and members of the public participate on FSMB boards and committees, and its actions and policies, including sharing best practices, are routinely communicated through various media forms (Chaudhry et al., 2015). Reinforcing the need for interdisciplinary practice, the FSMB is renowned for its coalitions and strategic partnerships with organizations that cover the gamut of medical and healthcare specialties. FSMB was also seminal in the formation of the Interstate Medical Licensure Compact which facilitates expedited licensing for physicians to practice medicine in multiple states (Steinbrook, 2014). Such a policy has been lauded as a potential avenue to ease physician shortages and mitigate duplicative efforts (Wakefield, 2010). As
previously noted, FSMB lack enforcement authority but does serve as a compelling example of federal familiarity and recognition of individual SLBs and their respective authority to independently address and adjudicate medical and other complaints.

*Department of Labor and Industry Business Standards Division Professional Licensing Bureau*

The Montana Department of Labor and Industry (MTDLI) ([https://dli.mt.gov/about](https://dli.mt.gov/about)) is a government entity tasked with maintaining oversight to the well-being of Montana's workers, employers, and citizens, and upholding their rights and responsibilities (MTDLI, n.d.). A critical component of the MTDLI is the Montana Standards Division, which is responsible for overseeing professional and provider licensing, to include ensuring and addressing questions regarding standards and ethics of licensees, as well as determining the merits of complaints related to unprofessional conduct (Montana Governor’s Professional and Occupational Report, 2018).

Specific to this proposal, six Montana licensing boards have been identified as having direct oversight of clinical providers involved in the diagnosis, treatment, and management of TBI and its associated sequelae, including: 1) medical examiners, 2) occupational therapy, 3) physical therapy, 4) speech pathology, 5) psychology, and 6) behavioral health.

The composition of each of these licensing boards reflects interdisciplinary practice and principle. For example, the Board of Medical Examiners is comprised of providers across multiple disciplines. As noted on its official Montana.gov website ([http://boards.bsd.dli.mt.gov/med#0?4](http://boards.bsd.dli.mt.gov/med#0?4)), under Montana law, sitting members on the Board of Medical Examiners must include:
• five physicians having the degree of Doctor of Medicine (M.D.) including one member with experience in emergency medicine
• one physician having the degree of Doctor of Osteopathy (D.O.)
• one licensed podiatrist
• one licensed nutritionist
• one licensed physician assistant
• one licensed acupuncturist
• one volunteer emergency care provider
• two members of the general public who are not medical practitioners

Even among a single discipline, sitting members must represent the full spectrum of the discipline. The Board of Psychologists, for example, must consist of six members including two licensed psychologists in private practice, one licensed psychologist in public health, one licensed psychologist engaged in the teaching of psychology, one licensed behavior analyst, and one member from the general public (Mon. Code Ann. §2-15-1741). Similar member requirements for other disciplines are also noted.

**TBI-related Interdisciplinary Advisory Committees**

**Montana Governors Traumatic Brain Injury Advisory Council**

The Montana Governor’s Traumatic Brain Injury Advisory Council was authorized in 2003 and intended to advise and make recommendations to the governor on ways to improve and develop services for TBI survivors and their families. Additional responsibilities include coordination of services between public and private bodies, public awareness campaigns for
prevention, educational programs, and research (Montana Department of Health and Human Services, n.d.).

Of note, all 50 states have a similar version of this advisory council/board. Typically, states which with higher population density, such as Washington (https://www.governor.wa.gov/boards-commissions/board-and-commissions/profile/Traumatic%20Brain%20Injury%20Council) and Texas (https://hhs.texas.gov/about-hhs/leadership/advisory-committees/texas-brain-injury-advisory-council), are more robust in their composition, while others, such as North Dakota (https://www.nd.gov/dhs/services/mentalhealth/biac/index.html) and Rhode Island (https://opengov.sos.ri.gov/boards?EntityID=3579&SelectUser=) have smaller representation. Independent of its size, councils/boards are interdisciplinary to include having appointed members of the public. In addition to appointed members, representatives from various state agencies that provide support and services to people with brain injuries represent (non-voting) members. While the councils/boards do not make medical decisions or oversee complaint processes, per se, they are all composed of interdisciplinary and quasi-medical members who are charged with making a combined assessment to their respective governor’s office on matters related to advocacy and resources for people affected by TBI.

**Texas Medical Advisory Board**

In operation since 1970 and created to reduce the number and severity of motor vehicle accidents in Texas, the Texas Medical Advisory Board for Driver Licensing is tasked with determining whether a driver’s medical condition could adversely limit their ability to safely operate a motor vehicle (Texas Department of State Health Services, 2020). The interdisciplinary board was created to evaluate medical data in driver fitness evaluations for those affected by
various medical conditions, including (but not limited to) TBI. The board consists of an interdisciplinary panel of licensed doctors appointed by the Texas Department of State Health Services.

Although the board is primarily comprised of medical doctors, the current composition consists of several specific specialties to include general surgeons, neurologists, optometry, emergency medicine practitioners, neuropsychology, and family practitioners – all of which are integral to any interdisciplinary treatment team in the realm of TBI management and care (Chen et al., 2020). Specific to their evaluations of persons with brain injuries, the Texas Medical Advisory Board serves as another example of several medical specialties working together to ascertain the defects and impacts of TBI and also serves to show the complexity of the injury and how it is evaluated (Chen, et al., 2020).

**Competing Healthcare Systems**

**Department of Veterans Affairs (Federal) TBI-related Healthcare Services**

In the federal medical system, the US Department of Veterans Affairs (VA) is the lead agency in providing veteran related TBI healthcare and medical services. The VA is broken down into three parts: the Veterans Healthcare Administration (VHA), the Veterans Benefits Administration (VBA), and the National Cemetery Association. While the VHA provides healthcare and the National Cemetery Association provides death-related internment and other services, the VBA is responsible for providing disability compensation and other benefits to veterans disabled or impaired because of military service in tandem with the VHA (Office of Human Resources Management and Labor Relations, n.d.). For example, to be awarded disability compensation, the servicemember or veteran must receive a service-connected rating from the VBA based on evaluation(s) conducted by multidisciplinary providers within the VHA.
The degree to which a veteran is disabled determines the percentage of service-connection, which in turn governs the number of benefits and related levels of healthcare entitlement through the VHA (NASEM, 2019).

To clarify, upon entry into the VA system, a Compensation and Pension examination is conducted for the VBA by clinical professionals within the VHA as part of the process for generating detailed clinical information to be used by the VBA to determine both the existence and percentage of a service-connection disability and appropriate compensation (NASEM, 2019). While these two entities fall under the VA and frequently work together, they are in theory entirely independent from one another, which can often lead to a lack of internal transparency and communication failures, adversely affecting veterans, their families, and their communities.

In the realms of TBI treatment and assessment, the VA recognizes four distinct professional disciplines that can initially diagnose a TBI: neurologists, psychiatrists, physiatrists, and neuropsychologists (NASEM, 2019). The VA also allows for a generalist clinician (e.g., a physician, physician assistant, nurse practitioner, or psychologist) to evaluate and assess “residuals of TBI” – defined as ongoing sequelae that may impair normal functions in everyday life (NASEM, 2019).

While one could construe that this is a positive and proactive approach from a policy angle, three critical problems emerge. First, although the VA may argue that they can regulate their own providers through “federal supremacy”, this is not always the case (Department of Veterans Affairs, 2020). Even though a VA provider may be credentialed in a certain state, the individual state where a federal medical facility may reside and where they practice, may not recognize this claim (Mullangi et al., 2021). Additionally, certain diagnostic and professional
protocols to include levels of individual training and expertise may not be to the individual state’s standards (Noble & Heale, 2016). Second, physicians and practitioners in the federal system must be licensed through at least one individual state. While the federal system recognizes reciprocal agreements to practice medicine, the individual practitioners must still uphold the tenets of their licensure through their state thus potentially requiring providers to adhere to two distinct methodologies. Third, the inflexibility of these requirements can cause individuals lacking certain formal or specialized training (as recognized by the federal system or state) to practice outside the scope of their licensure which can lead to inappropriate or incorrect diagnoses, thus adversely affecting the patient on numerous social, emotional, and financial levels.

**State of Montana TBI-related Healthcare Services**

In Montana, outside of the federal VA system, there are numerous entry points into the healthcare system for those effected or experiencing TBI-related sequelae, ranging from local and community clinics and hospitals, academic institutions, such as the Rehabilitation Hospital of Montana in Billings, the Neural Injury Center at the University of Montana (UM), and quasi federal/state systems such as the Bureau of Indian Affairs and the Indian Healthcare System located in several reservations throughout the state. These organizations serve different populations and offer an array of diagnostic and treatment-related services for TBI, but still possess a very strong interdisciplinary evaluation and treatment component. Also, in some cases, such entities have the authority and expertise to make recommendations specific to the realms of individual assessments for state-based programs to include Social Security. However, the sheer number and complexities of these organizations also open the same proverbial door to the challenges that the federal system experiences as it relates to an undefined and non-standardized
pathway in consistent diagnosis and subsequent assessments. While this may be considered questionable, one must not overlook the cultural and behavioral considerations in a challenging geophysical and socioeconomic environment such as Montana that can impede the application of consistent and standardized care and evaluations (Yue et al., 2020) which in turn can lead to administrative and malpractice complaints against providers.

With high incidence and prevalence rates of TBI in Montana (Haarbauer-Krupa et al., 2018) to include an extremely high veteran population (per capita) (United States Census Bureau, 2015), it can and should be assumed that the large number of TBIs that require evaluation, compensation, and eventual long-term management can put a quality control and financial strain on any operational system associated with clinical evaluations and assessments (Chen et al., 2018). In this vein, mistakes can be made and become very difficult to expediently rectify in both federal and state-based systems, particularly if multiple disciplines and pathways of treatment are involved. These healthcare systems should benefit all Montanans, veteran or otherwise, and by extension, their families, as appropriate. Montanans are entitled to fair, competent, and unbiased TBI care and evaluation, free from what could be construed as an excessive frequently combative system with highly interpretive rules and regulations.

To address related disputes, there should be a system or avenue for all Montanans to pursue an independent, qualified, interdisciplinary, and unbiased review of their evaluation, diagnosis, and condition(s) related to TBI if they feel a complaint is warranted. Unfortunately, all one needs to do is scan the headlines to see that the current and frequently competing medical “systems” in place are failing to accomplish this goal. As previously highlighted, medical organizations within these systems have different regulations for internal provider qualifications and different and potentially arduous pathways to seek interdisciplinary care and possible
rectification. Bottom line: there is no standardization to address complaints across the spectrum, and, to my knowledge, effective approaches to standardization have yet to be addressed by state or federal entities within Montana.
CHAPTER 3. Research Design

This study used a mix-method, three-arm exploratory study design. Mixed methods research methodology gained traction in the 1980s as it provided multiple methodologic approaches to examining more than one set of convergent findings for one problem of interest (Creswell, 2013; Ahuja et al., 2015). As part of the mixed methods approach, a parallel convergent design (Caffey et al., 2017) was chosen (Figure 3.1). This study was comprised of two independent studies: one qualitative (Study #1) and one quantitative (Study #2) and the results of each were triangulated in a third, hybrid mixed methods, data integration study. Also known as concurrent triangulation, the convergent parallel design has become a common form of mixed methods research (Caffey et al., 2017). Using such an approach, the qualitative and quantitative data are gathered simultaneously, yet independently, through different methodologies and then analyzed to answer research questions to contribute to the understanding of a particular phenomenon (Caffey et al., 2017), in this case the justification and feasibility of creating a stand-alone, state-level, interdisciplinary TBI-SLB.

The qualitative arm consisted of narrative source data collected from a set of semi-structured interviews. The interviews were conducted with TBI professionals from the Center for Neuroscience and Regenerative Medicine (CNRM) in Bethesda, MD and the Long-Term Impact of Military-Relevant Brain Injury Consortium Chronic Effects of Neurotrauma Consortium (LIMBIC-CENC) in Richmond, VA. This purposive sample included individuals from at least six pre-identified TBI-related specialties: 1) medical examiners, 2) occupational therapy, 3) physical therapy, 4) speech pathology, 5) psychology, and 6) behavioral health. This sample was chosen to target an assortment of healthcare professionals with technical and professional experience with respect to TBI (Chen et al., 2020). One of each specialty at minimum was
chosen and interviewed. The quantitative arm of this study consisted of analyzing independently collected historical, financial, and licensure data from the MTDLI from 2014-2019.
Figure 3.1 Research Design

**Qualitative Data Collection**
- N=26
- Semi-structured interviews
- LIMBIC – CENC, CNRM

**Quantitative Data Collection**
- Activities data (revenues and expenditures) extracted from all 34 SLBs between 2014-2019.
- Activities (revenues and expenditures), Complaint Summaries (complaints), and Statistics (license applications) data from the six TBI SLBs.

**Qual Data Analysis**
- Content analysis, deductive approach
- Transcription
- Coding
- Descriptive statistics

**Quant Data Analysis**
- Non-parametric
- Linear/multivariate regression modeling
- Correlation coefficient (r)
- Descriptive Statistics

**Integration/Merging**
- Parallel Convergent Design
- Side-by-side joint triangulation display
- Descriptive statistics
- Narrative approach/explanation

**Results**

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Research Question #1: Is the development and potential creation of an interdisciplinary SLB for adjudication of complaints of healthcare providers related to the management of TBI feasible? Would professional opinion of practicing clinicians and researchers support or deter the development of such a model?

Hypothesis #1: Interview data from CNRM and LIMBIC-CENC will support rationale and justification to create an interdisciplinary board specific to adjudicating TBI complaints.

Research Question #2: What is the comparative relationship between available financial resources of all Montana SLBs vs those associated with six SLBs of interdisciplinary providers of TBI (TBI-specific SLBs)? What is the individual and collective relationship of the six Montana TBI-specific SLBs in Activities, Statistics, and Complaints and how do they relate to numbers of complaints and license applications?

Hypothesis #2: Comparison of Activity, Statistics, and Complaint data from Montana SLBs will show justification for creation of interdisciplinary licensing board for TBI
This triangulation design of this mixed-methods study compared and incorporated the results from both the qualitative and quantitative study arms. The individual collection methods for the qualitative and quantitative studies are straightforward and outlined within the individual studies, but the crucial point was the integration of the qualitative and quantitative data (O’Cathain et al., 2010). When these separate components were integrated through triangulation using a side-by-side methodological comparison in the data analysis phase of the study (Razali et al., 2019), it was expected that the comparison would display areas of compatibility and fit of certain data sets (Fetters, 2013) as well as contradiction in other data sets (Ostlund et al., 2011). The aim of this last step in this design was to maximize the strengths and highlight the weaknesses in each data set comparison between the two aforementioned studies (Caffey et al., 2017). Additionally, in utilizing different qualitative and quantitative approaches to create and compare findings, the validity of the results was made stronger through this convergence (Ahuja et al., 2015).

As this project involved human participants and human subject’s protection, the researcher applied for and received approval from the UM Institutional Review Board (IRB) dated 7 July 2021 to undertake this project. The UM IRB approval number for this project is #121-21 (Appendix A).

**Quality Management Theory**

To operationalize this study and better understand these focus areas, a conceptual framework and theory were chosen to understand and investigate the areas of focus listed above and their influence in this research on the potential creation and implementation of a TBI-SLB (Camp, 2001; Miles & Huberman, 1994). The theoretical framework utilized was Quality Management Theory (QMT).
QMT is a theory that holds that “performance is enhanced by designing products and services to meet or exceed customers’ expectations and by empowering workers to find and eliminate factors that undermine product or service quality” (Thompkins, 2015). QMT originated in the late 1920s and can be found in the core concepts of writings by Organizational Theory pioneers including W. Edward Deming, Kaoru Ishikawa, and Joseph Juran (Thompkins, 2015). QMT started as a form of statistical control but evolved over the years in many global public, private, academic, and government venues (Nair, 2016) as a management and organization tool.

Though at one point in time it was considered to be “faddish” in nature, QMT is now widely accepted and implemented by business, public service, education, and healthcare organizations as a functional theory of management and organization structure (Nair, 2016). QMT’s application in various fields, particularly business and subsequent profit-loss margins, might differ, but as per Deming (2018):

In most governmental services, there is no market to capture. In place of capture of the market, a government agency should deliver economically the services prescribed by law or regulation. The aim should be distinction in service… increasing cohesion of management and improving quality of services. (p. 6)

It is this last sentence that validates usage of QMT is this research. Furthermore, as QMT is used in numerous fields of endeavor, its use in Public Health with a focus on seeking efficiency and equity make it a logical choice for a conceptual framework.

With QMT’s inherent focus on not only the smaller, more targeted areas listed above, but also the focus on larger concepts such as synergetic operations, system improvement, stakeholder satisfaction, and collaboration of efforts, QMT will serve as a strong conceptual framework to undertake this research (Thompkins, 2015).
CHAPTER 4. Qualitative Assessment of Professional Opinion

Research Question #1: Is the development and potential creation of an interdisciplinary SLB for the adjudication of complaints against healthcare providers related to the management and treatment of TBI feasible? Would professional opinions of practicing clinicians and researchers support or deter the development of such a model?

Hypothesis #1: Interview data from the CNRM and LIMBIC-CENC will support rationale and justification to create an interdisciplinary board specific to adjudicating TBI complaints.

Purpose

The purpose of this exploratory qualitative arm of the dissertation was to gauge professional opinion from two federal-level TBI and psychological health clinical research groups as it relates to the feasibility and justification of implementing a state-based interdisciplinary TBI oversight committee to adjudicate TBI-related practitioner complaints. Providers, clinicians, researchers, and associated personnel with relevant experience in TBI-related interdisciplinary research at CNRM in Bethesda, Maryland and at LIMBIC-CENC, in Richmond, Virginia, were interviewed to gather insight into the feasibility and possible creation of a stand-alone state-level interdisciplinary TBI-SLB.

Interviews were conducted with at least six pre-identified TBI-related medical specialists: 1) doctors of medicine or osteopathy, 2) occupational therapists, 3) physical therapists, 4) speech pathologists, 5) psychologists, and 6) behavioral health providers, as well as other associated personnel with relevant professional experience in TBI-related fields. This sampling frame was specifically chosen to target an assortment of healthcare professionals with extensive technical and professional experience related to TBI (Chen et al., 2020). The collection of information
relevant to TBI assessment and management from this wide-ranging, interdisciplinary, and purposive sample within CNRM and LIMBIC-CENC provided their opinions, experiences, and positional viewpoints involving multiple aspects of TBI to include SLB complaint adjudication. Due to the unique mission and composition of these groups, the interview questions were designed to identify content (Fereday et al., 2006) specific to each individual’s expertise, experience, and insight of the similarities and differences between TBI-relevant medical systems to potentially highlight the need for a standing TBI-SLB oversight committee.

**Quality Management Theory (QMT)**

A QMT framework was chosen and used to develop interview questions and guide a construct in which to explore, understand, and investigate professional opinion and experience (Ferrand et al., 2022; Soltani et al., 2008; Aggarwal, 2019). The levels of influence and impacts of numerous variables in this research should highlight gaps in operational continuity that can be identified and addressed with respect to this proposed TBI-SLB (Camp, 2001; Miles & Huberman, 1994). While gaps in care are likely to exist between humanistic (provider) and patient components based upon individual healthcare and other specific needs, it was expected that larger impediments to the standardization of successful TBI management and operational systems would be discovered. These systems were investigated to identify, define, and address the potential lack of operational efficiency that is critical in overseeing provider qualifications, standards of care, and other medical TBI-related systems that do not effectively provide oversight or evaluate internal and external healthcare decisions (Barr, 2019). The response data was collected through semi-structured interviews and analyzed to identify points that would either support or deter in the justification for creating a TBI-SLB. The end goal of this portion of the study was to highlight existing functioning and non-functioning areas of synergistic
operations and identify methods of improvement to increase stakeholder satisfaction, streamline resources, and ensure equity and fairness for both the patient, provider, and the community (Thompkins, 2015).

Methods

Research Design

A direct content analysis research design and approach was implemented to provide a “check and balance system” between the multiple interview data collection processes (Dahlberg & Dahlberg, 2019). Such a design was chosen to better understand and interpret an individual’s professional and personal experiences as it pertains to the relevance of validating and extending existing conceptual QMT theoretical framework and theory in the potential creation of a TBI-SLB (Hickey & Kipping, 1996).

As part of this qualitative arm, 26 semi-structured interviews were conducted. Direct contact analysis with a deductive approach was chosen and used to interpret the data, develop themes, and guide the coding of response data gleaned from the interviews. The goal of this directed approach to content analysis was two-fold: 1) to validate the data through theoretical concepts and 2) assess its overall feasibility in establishing a TBI-SLB through a QMT conceptual framework (Hsiesh & Shannon, 2005). This deductive application (Mayring, 2000) which applied a “top down” approach based on certain assumptions combined with core knowledge of TBI-related research, formed the basis for a platform to form predictions between variables and relationships to include selecting the most appropriate strategies for demonstrating validity and reliability (Potter & Levine-Donnerstein, 1999; Mayring, 2000; Hsiesh & Shannon, 2005). This method was conducive to a semi-structured interview approach as it allowed the identification of emerging themes through the QMT conceptual framework, as well as initial and
organizational coding based on predictions. Early exploratory data collection and under these themes began to emerge early in the interview process and were used as organizational tools to begin classification based on frequency and type of response (Miles et al., 2020; Potter & Levine-Donnerstein, 1999).

**Participants**

As this project involved human participants and human subjects’ protections, an IRB was submitted and received approval to undertake this project from UM IRB on 7 July 2021. The UM IRB approval number for this project is #121-21 (see Appendix A).

Inclusion criteria for the study required individuals to be a licensed clinician/provider in one of the corresponding six specialties or a recognized subject matter expert or relevant research or clinical contributor in TBI-related fields of research as defined by CNRM and LIMBIC-CENC. Participants were required to be in good ethical and legal standing with their respective SLBs; if not currently subject to state or independent licensure, participants must be in good professional and ethical standing with their respective professions (other SLBs), CNRM or LIMBIC-CENC. Individuals with current or past revocation or suspension of medical license or professional equivalent from a SLB or independent entity, those involved in an ongoing investigation by their respective SLB, and those with known past or current conflict(s) of interest were excluded.

Participants included at least one researcher or physician/provider from each of the following six disciplines: 1) doctors of medicine or osteopathy, 2) occupational therapy, 3) physical therapy, 4) speech pathology, 5) psychology, and 6) behavioral health, as well as other associated personnel with relevant contributions and professional experience in TBI-related fields in both CNRM and LIMBIC-CENC.
Participants at CNRM and LIMBIC-CENC were known to the researcher. The directors of CNRM and LIMBIC-CENC were contacted and permission to interview participants was requested. Access to CNRM and LIMBIC-CENC was granted by the CNRM Director and the LIMBIC-CENC Clinical Director. Participants were recruited via email or phone through CNRM and LIMBIC-CENC. Potential participants were informed of IRB approval through the University of Montana and, if interested, were given an informed consent document via email, if requested. Verbal consent was requested by the researcher and received at the beginning of all interviews.

Several specialties had multiple interviews, including other associated personnel with relevant professional experience and contributions in TBI-related fields of research. Some researchers without current licenses to practice as well as others outside these specialties who did not require medical licensure were also interviewed based on their extensive knowledge and professional experience with TBI-focused teams and research.

**Interviews**

A series of semi-structured interview questions was developed (see Appendix B) to determine the professional background and levels of experience of interviewees, as well as roles and inherent responsibilities inherent to specific disciplines. Additionally, the questions offered respondents the opportunity to comment (both positive and negative) on other TBI-relevant medical entities and/or their respective roles and operational systems regarding TBI treatment, evaluation, and adjudication, as appropriate. The intent was to examine how these narratives, opinions, and relayed experiences would influence future recommendations for oversight framework.
The interview data collection concerning all participants occurred over the course of six calendar months either in person or via telecommunication (e.g., video conference, telephone). In addition to the participants identified above, interviews were also conducted with two healthcare epidemiologists affiliated with LIMBC-CENC and one consumer advisor to CNRM. While not clinicians, and as highlighted above, these three individuals have critical knowledge of TBI and have made considerable personal and professional contributions as recognized by both LIMBIC-CENC and CNRM Directors in their assigned roles, duties, and responsibilities as part of both organizations TBI-related research missions.

The interviews were conducted and recorded in accordance with IRB protocols and acknowledgment of informed consent. Interview durations varied between 30-45 minutes for telephone interviews and video conferencing interviews and 10-15 minutes for in person interviews. The interviews were constructed as semi-structured, although several of the video conferencing interviews became more open-ended in structure depending on the background and depth of information provided by the interviewee. With the exception of the two in-person interviews that were taken exclusively using fieldnotes, all interviews were digitally recorded, transcribed, and reviewed by the researcher for accuracy.

Among the interviews, two were conducted in person, four were conducted by telephone, and 20 were conducted using video conferencing. Extensive notetaking (i.e., fieldnotes) was undertaken with each interview. The fieldnotes were kept in a personal journal that was secured in a file cabinet when not in the physical possession of the principal investigator (PI). The fieldnotes consisted of all 26 interviews to include several notes about emerging themes, possible codes and personal as well as background observations concerning the tone, tempo, and pace of the interview.
Data Collection & Analysis

Data Collection. Interviews recorded using Zoom videoconferencing software proved to be the most efficient method of data collection as Zoom had a high degree of accuracy in its internal transcription before review. Three interviews were conducted through a personal Zoom account which did not offer transcription services. These interviews were subsequently played back through the UM Zoom and were transcribed by the UM Zoom account and reviewed for accuracy. Four of the recorded interviews were undertaken through a telephone interview and recorded using a digital voice recorder. These interviews were subsequently played back into UM Zoom where they were transcribed and reviewed by the PI for accuracy. The in-person interviews were recorded specifically through fieldnotes.

The duration of time each interview transcription was reviewed averaged between 60-120 minutes. The higher end reflected to lack of codes and accuracy in interview techniques and transcription difficulties in the earlier interviews and the lower end of the time span reflected the increased accuracy of exclusively using the codes and UM Zoom account in transcription to include increased PI knowledge of the participant, pace of the interview, and location of relevant interview responses and information. As time progressed and more interviews were conducted, the pace of the interviews became more relaxed, and accuracy of responses was more direct. Key time points and annotations to relevant conversations and inquiries to all interviews were recorded in the fieldnotes. The fieldnotes were used in every aspect of the interview process and as such served as an early codebook to separating pertinent information from sidebar conversation. The two in-person interviews were considered artifacts as they were conducted not using video or recording techniques and were recorded in the fieldnotes, reviewed, and subsequently coded under the same established criteria as the audio and video interviews.
Data Analysis. Interview transcripts were read by the researcher, compared, analyzed, and prepared for coding similar in style demonstrated by both LeCompte and Schensul (1999). Field notes were also reviewed periodically in the interview process for content and accuracy.

Of note, fieldnote entries included recording relevant time points as they appeared on the Zoom display page when relevant points were discussed on the quickly emerging themes of Revenue, Standards, and Scope/Oversight, as well as other areas of potential relevance and interest. When interview data was recorded on Zoom, transcribed, complied, and compared to time point entries in the fieldnotes, information blocks were identified, and codes were tentatively developed for the three aforementioned themes. These time points made it more efficient earlier in the transcription review process to accurately identify, create, and assign permanent “posterori” codes for the relevant information provided (Swain, 2018) and build a platform to base further data collection and analysis.

This was an effective technique as the interviews began with no preset or identified “a priori” codes and could range in length and pace of interview (Swain, 2018). It also provided a way to more accurately and efficiently separate relevant data from other, less relevant, but still usable data to include the complete separation of extraneous data that is not without value but was not directly relevant to the current research plan.

Using LeCompte and Schensul’s (1999) approach to data analysis and coding, three key themes as outlined above emerged in the review process in response to several questions and were subsequently used as categorial headings: 1) Standards, 2) Fiscal Concerns, and 3) Scope/Oversight. The responses related to these three themes were highlighted in the transcripts and fieldnotes for reference using different colored markers. Under these categories, all relevant data were accounted for and classified and prepared for coding.
When the primary themes were identified and categorized, responses under these themes were given posteriori codes as well as a color identifier (Swain, 2018). As the interviews progressed, several responses under these categories emerged with some frequency and were also subsequently assigned posteriori codes and individual identification colors. Through existing knowledge and top-down predictions, analysis of data began by using key conceptual factors and frequency of response to organize coding (Potter & Levine-Donnerstein, 1999). Adherence to a manual approach of identification and classification of response data through the examination and cross-refencing of fieldnotes and transcript analysis provided the methodological platform to base and create a codebook to gauge frequency of thematic response for descriptive analysis. This manual approach was chosen as it set the pace for a slower, more focused, and more meaningful comparison of data which enabled and fostered an interpretive insight (Maher et al, 2018). Additionally, a manual approach facilitated and helped maintain a strong focus toward data engagement and visualization thus helping to code data relevant to the identified categories and away from the pitfalls of coding all data, relevant or not (Mattimoe et al., 2021). Or, as simply put another way and supported by the qualitative researchers García-Horta and Guerra Ramos (2009): “moving away from data fetish, or the ‘let’s code everything strategy’ which can lead to excessive and non-reflexive coding” (p. 163).

Identifying and categorizing thematic responses into factors as they developed into a workable and usable descriptive data set resulted in a large and novel format display board (Maher et al., 2018) or, quite simply, a “wallchart”, which was created by hand to manage the response data (LeCompte & Schensul, 1999). The creation of a wallchart facilitated easy comparison and the eventual operationalizing of these factors into variables. This technique provided a more “eye level” component and closeness to the data that allowed for efficient
coding, analysis, data transfer, and subsequent tabulation (Mattimoe et al., 2021). Independent domains (specific TBI disciplines) were developed as were specific domains (yes/no questions), factors (frequency of responses in the categories of standards, oversight, and fiscal concerns), and variables (variations and numbers of responses within established factors) (Appendix C). The manual-creation method that was utilized enabled response data to be easily organized by type and participant. The manual-creation method also served to efficiently manage and track the data and allow for a degree of reflexivity that helped ensure the reliability and internal validity of the collected data as it was being developed and transferred to the wallchart (Sang & Sitko, 2015).

As referenced earlier, using a deductive, top-down approach, themes began to materialize early in the interview process and were categorized. As such, coded data from the transcripts and fieldnotes were transferred and entered onto the wallchart by hand when an interview was reviewed, transcribed, coded, and colored. The responses within all domains, factors, and variables were highlighted and charted using the same color-coded highlighting methodology for frequency based upon color classification. The color-coding methodology that was incorporated justified the basis and effectiveness of using the wallchart for the data analysis.

Data from the wallchart was used to create two codebooks. The first codebook became the wallchart that was used in the manual analysis. It contained the previously described recorded, coded, and analyzed data that was organized in a horizontal and vertical manner with specific numerical (1-4) or alphanumerical (Y/N/YN) codes. These codes were assigned to the variables based on type and number of individual responses and variations under the three primary themes identified: Standards, Fiscal Concerns and Scope/Oversight (Schensul et al., 1999; LeCompte & Schensul, 1999). A second codebook was generated containing unique
identifiers (abbreviations) in the form of numerical and alphanumerical codes for each variable by type and area of interest. The data was subsequently transcribed from the wallchart into Excel format\(^1\) and then uploaded and entered into “R” for statistical analysis.

Descriptive statistics were used to characterize the study sample and explore patterns among responses by participants from interviews which facilitated the quantification of the qualitative data gathered from the interviews. Such an approach was employed to examine patterns or trends gathered from the interviews, which, in turn allowed for accuracy in representing the frequency of responses in subgroups of interest and the reasoning for or against the proposed idea of a TBI-SLB. Response data collected and measured included: participants’ degree types, occupation, licensure, states of licensure, is TBI interdisciplinary, interdisciplinary team, clinician or researcher, state employed, interdisciplinary composition, will the proposed TBI-SLB work, is it good idea and why, and/or why is it not a good idea and why. Frequency of responses under the last three domains supported the identification, classification statistical representation of the three categories chosen: Standards, Fiscal Concerns, and Scope/Oversight. The response data was formulated into pie charts, bar charts, and geographical/demographical graphs to capture and accurately present the findings.

As part of the data collection and analysis, the rigor and trustworthiness of the research was maintained through a continuous focus in four areas: confirmability, dependability, transferability, and credibility. Confirmability was maintained through the use of an “audit trail”

\(^1\) (https://www.office.com/launch/excel?ui=en-US&rs=US&auth=1)
Extensive fieldnotes were taken that recorded not only specific data points and areas of emphasis in the interview process, but personal thoughts and observations during the interviews as well as ideas on how to proceed in the data collection, analysis and interpretation as new data and information became available. Dependability was achieved through occasional stoppages during research progress and comparing current data collection and analysis methods against the original proposal/plan and against themselves for consistency in the collection and analysis methodology (Korstjens & Moser, 2018). Transferability was maintained through the inclusion of a broad scope of TBI researchers, a detailed description of the interview questions, processes, and challenges, listed methods used in data transcription and a succinct description of the participants research organizations. Lastly, credibility was established and maintained through the use of a mixed methods parallel convergent study design, an honest, open exchange of information and intent in the interview process, and by targeting two different, but similar, research populations for the interviews. This “triangulation” of methods and sources (Noble & Heale, 2019) facilitated a data collection effort that produced large, robust, and detailed amounts of unbiased data gathered from professionals in various fields of TBI research who had unique insight into the research questions being explored.

Results

The results are broken down in two parts for clarity: demographics and response data. Demographic data was listed and graphed for comparison purposes only to provide a better understanding of the backgrounds of the participants interviewed. The response data was analyzed as it covered the reasoning for or against the possible creation and implementation of a TBI-SLB. Before the results are examined in detail, it should be noted that all interviewees (N=26) had a 100 percent response rate and identified the same answer in relation to several
interview questions. All interviewees reported that: 1) TBI is an interdisciplinary injury; 2) TBI requires interdisciplinary treatment; and 3) all professions explored in this research are required and/or expected to be part of the interdisciplinary team approach for TBI. Due to the 100 percent response rate for these three specific responses, they were not analyzed and represented using any type of descriptive statistics.

**Demographics**

Of the participants interviewed, the majority were female (53.8%), and most had obtained PhDs (53.9%), followed by MDs (30.7%) and MD/PhDs (7.7%) (Figure 4.1).

**Figure 4.1 Demographics of Study Sample (I)**

![Demographics](image)


The majority of participants worked in the field of psychology (n=6), followed by neurology (n=3), neuropsychology (n=3), neurosurgery (n=2), and public health (n=2); the sample constituted approximately an even mix of clinicians and researchers (Figure 4.2).
As shown in Figures 4.3 and 4.4, not all participants who had licenses to practice, practiced in the same state in which they were licensed or were currently licensed. It should be noted that in the last point of licensure, all interviewees fell within the inclusion criteria of this study in that they were in good standing within their respective states and/or professional organizations and each had made considerable and recognized contributions to TBI research and investigation within the consortia interviewed. To that end, some of the interviewees did not possess medical licenses, but worked closely with TBI organizations in their professions such as a healthcare epidemiologist. Others had held a professional medical license in the past when they practiced in clinical areas, but as researchers, did not currently require them. One participant was licensed directly through the NIH and did not require a state license. A therapist interviewed had an independent license and the consumer that was interviewed who was an integral part of the consortium was not required to have a license in their field of expertise.
Note. Sample sizes by USA state: Massachusetts (n=1), Minnesota (n=1), Maryland (n=5), North Carolina (n=1), Oregon (n=1), Pennsylvania (n=2), Texas (n=2), Utah (n=1), Virginia (n=5).

Two participants reported having independent licensure; six participants reported having a past or non-current license; one participant reported unlicensed.
Note. Sample sizes by USA state: District of Colombia Capitol Region (n=9), California (n=2), Minnesota (n=2), Oregon (n=1), Texas (n=1), Utah (n=4), Virginia (n=7).

**Responses**

When queried as to the merits of creating a specific TBI-SLB, more than half of respondents (57.7%) supported continued exploratory research on the matter and 42.3% agreed that if implemented correctly, the proposed board could function as intended (Figure 4.5). However, individual factors influencing the potential for success of the board were more divergent. In analyzing the data for individual factors that could influence impact, three main categorical themes emerged and are discussed below: 1) Standards, 2) Fiscal Concerns, and 3) Scope/Oversight.
Figure 4.5 Responses as to Feasibility of TBI-SLB

![Graph showing responses to feasibility of TBI-SLB]

*Note.* Panel a: Responses to whether TBI-SLB is a good idea. Panel b: Responses to whether TBI-SLB would work.

**Standards**

Figure 4.6 illustrates the distribution of issues specific to standards as reported by study participants. Concerns regarding standards as an influencing factor were described most often by the interviewees in the context of the absence of an interdisciplinary and medically agreed upon gold standard in TBI diagnosis, evaluation, and treatment. Other limiting factors attributed to standards as noted by interviewees were (1) the lack of unified measurements of TBI between disciplines; (2) the possibility that it might be difficult for different disciplines to work together in a unified manner given gaps in areas of practice, experience, and interdisciplinary standardization; and (3) conflicting medical rules between different organizations such as the state and the VA. Conversely, responses rate was almost as robust in areas that many believed could be a potential pathway to the successful creation of a TBI-SLB. These areas included (1) the creation of standards of oversight; (2) the creation of standards of protocol; and (3) the integration of multiple disciplines. As this area of response had the highest frequency of response, this section will be described in two parts: those of the opinion that standards will be
an impediment followed by those that believe standards could provide a path to TBI-SLB creation.

**Figure 4.6 Frequency of Standards Reported by Study Participants**

![Figure 4.6 Frequency of Standards Reported by Study Participants](image)

**Standards – Part 1.**

**Gold Standard.** Among those who perceived standards as being an impediment to the development of a TBI-SLB, the majority noted that the absence of a gold standard was a major issue of concern. While each independent medical specialty has their own preferred standards of diagnosis and evaluation, it was acknowledged by both specialists and non-specialists that there is no overarching or universal model for diagnosis or treatment of TBI across disciplines (Bodde et al., 2015):

- *Standards of evaluation and treatment are different between TBI disciplines and as such there is no one ‘gold standard’ of care.* (Neurologist/ Neurosurgeon, MD/PhD)
• No evidence-based ‘gold standard’ – so how are people filing a complaint against the standard? (Internal Medicine, MD)

**Measurement.** Several responses from interviewees expressed concerns that the lack of consistent standards for measuring TBI among disciplines was a major impediment and generally constituted a difficult path forward:

- **Everyone is trying to measure things in a different way.** (Neuroscientist, PhD)
- **TBI has a standard definition, but it is interpreted and measured differently based upon specialty.** (Psychologist, PhD)

**Practice, Experience, and Interdisciplinary Standardization.** Interviewees cited concerns of a negative nature that related to the levels of knowledge, experience, and standardization of TBI across disciplines as factors that could impact the feasibility of the proposed TBI-SLB model. Negative factors, as noted by two respondents:

- **The board could be used ad hoc and just pull experts when the need for the discipline arises** (Physical Therapy, MD)
- **Many practitioners have very different perspectives in this injury mechanism and conversely, what is a good outcome?** (Psychologist, PhD)
- **What are the different standards of evaluation, levels of experience and training and who justifies the appointment to a board?** (Neuropsychologist, PhD)

**Federal vs State Healthcare Organization and Rules.** This area was referenced with some frequency during the interviews. While not as prolific in its response rate, it was addressed in a very direct and robust fashion. In this case of these respondent, there are issue with continuity of care:

- **In the VA, some folks train, work in a position the move on – like VA docs – handoffs occur frequently, and fumbles can occur – what are the rules?** (Consumer, MS)
• VA changes providers frequently with no crosstalk with outside community partners or community-based providers – what happens when a gap occurs? (Art Therapist, MS)

Other respondents addressed the inability of the federal entities to work or coordinate with state-based or other local entities:

• Standards and rules are different in these systems. (Family Medicine, MD)
• State, federal, and local guidelines differ. (Neurologist, MD)
• The feds (VA) do not work well with others (Neuropsychologist, PhD)

Standards – Part 2.

Standards of Oversight Creation. There were certain beliefs that levels of practice, experience and standardization would have a positive influence on the proposed impact of the TBI-SLB. Several participants commented that the formation of a TBI-SLB could actually create standards of interdisciplinary oversight by combing professional input, experience and opinion:

• This model could have multiple inputs and could balance levels of experience through different perspectives and experiences. (Psychology, PhD)
• A board such as this over time could provide a clearly defined scope – both in terms treatment but also in oversight needs and patient pathways. (Art Therapist, MS)

Establishment of Procedures and Protocols. While most respondents identified the absence of a gold standard as a major barrier as highlighted above, some thought that, in theory, this issue could be overcome and utilized in facilitating the creation of a TBI-SLB as it could serve to create protocols and procedures that in turn could be utilized to integrate standards of universal TBI diagnosis/treatment across multiple disciplines

• It is unlikely that there will be one ‘gold standard’ among individuals on a board, but it might be possible to consolidate a pathway forward (Cognitive Science, PhD)
• There is a need for standardization of evaluation and treatment of TBI in all treating disciplines and levels of treatment – there needs to be a ‘gold standard’ but we are not there yet (PM&R, MD)

**Discipline Integration.** Many respondents felt that the integration of multiple disciplines into one-overarching and authoritative body would be fundamental is adding different levels of experience to any problem-solving process:

• *The interdisciplinary component adds extra value to any committee* (Internal Medicine, MD, MPH)

• *TBI is an interdisciplinary injury that requires an interdisciplinary team to come up with a care plan* (Neurosurgeon, MD)

• *No set standards of care, but an interdisciplinary board might be able to make recommendations as group to create accountability* (Physical Therapy, PhD)

**Standards of Interdisciplinary Measurement.** Some interviewees suggested that the interdisciplinary approach of the TBI-SLB could and would open a pathway to establishing an agreed upon or unilaterally consistent form of interdisciplinary measurement:

• *Teams should be well-versed and should know other disciplines areas of interest and evaluation [measurement]*. (Psychologist, PhD)

• *TBI is not dramatically different than other diseases in their diagnosis or prognosis (measurement)…many are of the same aspect and have the same challenges and the more minds, the better*. (Neuropsychologist, PhD)

**Fiscal Concerns**

Fiscal concerns had a smaller, positive response rate that stood in sharp contrast to the much larger negative response rate (Figure 4.7) and overall positive response rate shown in Figure 5.5. This inter and intra contrast was most apparent in areas concerning revenue generated and procedural questions concerning appropriate billing procedures and policies.
**Revenue.** A few interviewees agreed that fiscally, the creation of an TBI-SLB could streamline costs (e.g., labor, administrative, logistical), but they noted overwhelming that it might not create sufficient revenue streams to maintain its existence and may even challenge or compete with existing medical boards for revenue streams (Law & Hansen, 2010; Landess, 2019). Many socioeconomic and geopolitical actors could take a role in this issue, but funding and resources are often scarce in many poorer and rural states and subject to state-level legislative control and constraints (Landess, 2019): As one provider put forth:

*The states set fiscal priorities.* (Family Medicine, MD)

A few respondents highlighted that in their home states of licensure, licensing boards must produce a yearly positive net income. As noted by a respondent with an MD/PhD who had been previously appointed to a medical licensing board in their state of licensure and practice:

- **Boards need to generate revenue for the state but [boards] are sometimes resistant to change and accountability.** (PM&R, MD/PhD)


Overall enthusiasm to the concept of funding sources and loss of revenue state based TBI-SLB creation and associated monetary issues were of paramount concern to two respondents:

- There is indeed a benefit to interdisciplinary centralization, but the potential loss of jobs and revenue will be tough to overcome for many states. (Physical Therapist, PhD)
- Funding for training in this model is key...money is key! But where will it come from? (PM&R, MD)

**Billing.** The second most frequently identified factor within the context of fiscal concerns that could ultimately hamper the effectiveness of the integrity of the TBI-SLB was billing. Several interviewees made mention that insurance carriers and providers likely differed on the comprehensiveness of their assigned coverage and therefore may not authorize certain tests and procedures required for TBI diagnosis. In such a situation, as many noted, then patients could file complaints based upon perceived misdiagnosis or actual misdiagnosis based upon gaps in the continuity of care, particularly in a rural and socioeconomically challenged state with competing medical systems:

- Certain insurance providers will only pay for certain tests. Compound that with the lack of specialists required for TBI in some states and you see the problem. (Psychologist, PhD)
- In a lot of instances, third party payers do not cover certain tests so patients might be referred out and have to cover their own fees thus not getting care or treatment...add a lack of communication between providers, and you could get several complaints. (PM&R, MD)

And indeed, if lack of communication between providers was occurring in tandem with depleted fiscal resources and other possible health challenges for a patient, then there could be several differential diagnoses through discipline-specific standards of measurement which could further complicate the cohesion and consistency of care by providers. If a problem of competing
or incomplete diagnosis occurred, it was felt that individual discipline-specific issues should be adjudicated in practitioner-specific boards to control costs associated with adjudication, TBI-related issues in play or not:

- There could be too many standards in play...would need to stay board specific. (Neurosurgeon, MD)

- By profession, there are very different perspectives on injury mechanisms and what is considered to be a ‘good outcome’...this may push the need and use for specific boards as opposed to an interdisciplinary board. (Psychologist, PhD)

Although billing as a response had several negative implications, one respondent had some level of enthusiasm for a positive impact to the current TBI-SLB creation is this area:

- With multiple payer system in play that operate differently based upon funding – university, VA and private – the implementation of such a board may get them on the same page and by extension, cut billings costs to the patient. (Neuropsychologist, PhD)

**Streamline Costs.** In light of the overall negative response rate in this area, there were a few positive observations concerning the success of the idea in areas of cooperation and streamlining of existing financial systems to either enhance revenue streams or prevent waste – both in accordance with QMT:

- With multiple systems in play and the possible monetary funding overlap due to lack of organization and communication, this model could provide services that might streamline costs. (Neuropsychologist, PhD)

- Although this is a longshot, the upside might be adding another regulatory layer [which could add more bureaucracy] that could not only track funding, but patient safety. (PM&R, MD)
Scope/Oversight

As shown in Figure 4.8, although somewhat limited in frequency of responses relative to the other themes, Scope/Oversight, were identified as intriguing and influencing factors. This section will be described based upon the higher frequencies of response (cutoff -5).

Figure 4.8 Frequency of Scope/Oversight Reported by Study Participants

Leadership. A primary area of concern in this category revolved around who would take the lead in the organization and leadership of the TBI-SLB in its execution of its assigned duties and the possibility that impediments to unity of command and establishing a fluid relationship might develop or create additional barriers to successful implementation.

- *This should be an ME only functional board.* (Family Medicine, MD)
- *Learning one system to another is very hard. It should be kept simple.* (Internal Medicine, MD)
- *MDs usually take charge – so psychology becomes secondary?* (Clinical Psychologist, PhD)
While these opinions may have validity, others believed forms of professional friction could further hamper the concept of the idea. As per other respondents:

- *Teams need to play ball and they might not!* (PM&R, MD)
- *Power shift and dynamics (between certain disciplines) might be a problem.* (Psychology, PhD)

**Levels of Experience.** However, the potential for a positive impact was outweighed by concerns that there would likely be a disparity related to the depth of professional experience in TBI across the various disciplines which would generate debate regarding which discipline or system of measurement should be applied or take precedent when deliberating each individual case:

- *A combination of specialists could lead to problems. Who in the proposed team should take the lead?* (Psychologist, PhD)
- *Power differentials among specialties could create dysfunction.* (Psychologist, PhD)
- *Different resource allocations, levels of measurement and unfortunately, politics [will come into play].* (Cardiovascular Health Researcher, PhD)

**Politics/Apathy.** Although of a low frequency response rate, some respondents were concerned that political entanglements could create a barrier to the creation, function, and mission of a TBI-SLB:

- *Politics versus policy, who answers to who? The devil is in the details.* (Neuropsychologist, PhD)
- *Politics can be problematic.* (Healthcare Epidemiologist, PhD)

**Novel Approaches/Provider and Patient Protections.** Some respondents agreed that the creation of a TBI-SLB would reflect a new and novel approach to the adjudication of TBI-
related complaints and might create a more fair and equitable recourse or protection(s) for both providers and patients:

- *Cross talk and information sharing can help people get on the same page.* (Cognitive Science, PhD)
- *[There are] multiple inputs…each could have a different perspective on the patient and/or provider.* (Psychology/Nursing, PhD)
- *[While there are] no set standards… the board might be able to make recommendations and create accountability.* (Physical Therapist, PhD)
- *People could have different perspectives on the patient and the issues in play* (PhD, Psychology)

**Disparity Reduction.** While receiving only one response, the possibility of delivering fair and balanced healthcare to reduce health disparities was mentioned by one respondent:

- *With cultural and other issues in play compounded with lack of resources and providers, this [TBI-SLB] could potentially reduce disparities in TBI across vulnerable populations* (Healthcare Economist, PhD)

To put the interrelated results categories in perspective by discipline, a bar chart of how individual professions fell into the coded response areas (if reported) is shown in Figure 4.9. When examining the positive and negative response rates concerning the different categories within the standards theme (e.g., gold standard, measurement, and practice, experience, and interdisciplinary standardization), MDs had an overall higher negative view of the implementation of a TBI-SLB. Conversely, PhDs had a higher level of enthusiasm for the positive implementation of a TBI-SLB. With respect to the Revenue and Scope/Oversight categories, MDs and PhDs had a very similar, if not proportional response, in both positive and negative factors.
Figure 4.9 Study Participants Reporting of Standards, Money, and Scope/Oversight by Degree

| SY1   | Will create standards and oversight |
| SY2   | Will create standards of procedure/protocol |
| SY3   | Integrates multiple disciplines |
| SY4   | Will create interdisciplinary standards of TBI measurement |
| SN1   | Fed vs State rules different |
| SN2   | No "Gold Standard" of TBI diagnosis |
| SN3   | No unified measurement of TBI across disciplines |
| SN4   | Complaints vary across disciplines |
| SN5   | Different levels of experience, understanding of TBI / roles |
| MY1   | Streamline costs |
| MN1   | Billing concerns |
| MN2   | Revenue |
| MN3   | No money in it |
| OY1   | Novel Approaches |
| OY2   | Reduces disparities in population |
| OY3   | Protects providers / patients with complaints (frivolous / fairness) |
| ON1   | Politics / bureaucracy |
| ON2   | Apathy |
| ON3   | Scope undefined – Who is in charge? |
| ON4   | Levels of experience by discipline |
**Discussion**

The interviews in this qualitative study arm were conducted to understand if the development of an interdisciplinary board for the management and adjudication of complaints related to TBI was feasible. Professional opinions of practicing clinicians and researchers within CNRM and LIMBIC-CENC were collected, examined, and analyzed to ascertain the feasibility and justification in support of the potential development of a new interdisciplinary model.

The majority of the respondents had obtained PhDs and were followed by MDs; some participants had MS and secondary MPH degrees. This is likely attributed to the professional composition of the proposed TBI-SLB and the similarity of the compositions of the respondents associated with CNRM and LIMBIC-CENC. The vast majority of the professions in the proposed TBI-SLB and CNRM/LIMBIC-CENC are inherently MD/PhD required professions.

Among the MD/PhD respondents, the majority were licensed or had been previously licensed to practice in their respective medical professions throughout several states; the majority, though not all overlapped. The distribution of licenses across the states reflects that respondent either worked or were affiliated with CNRM and LIMBIC-CENC clinical and research arms that were based in the same state as the research entity or possessed reciprocal agreements allowing individuals to practice in multiple states.

The finding that there was absolute and unanimous consensus among all interviewees regarding the interdisciplinary nature of TBI and the need to incorporate interdisciplinary approaches to treatment with an interdisciplinary team was expected and confirmed as the interviews were conducted with individuals from the aforementioned federal-level TBI research and treatment organizations, CNRM and LIMBIC-CENC, who specialize in the interdisciplinary research and treatment modalities of TBI.
Additionally, the data suggest that the theoretical creation of a TBI-SLB had significant initial support and merit as observed in the in larger, overall positive (Y) and neutral (Y/N) response rates to initial queries as to would this concept of a TBI-SLB work (42.3%/34.6%) and is it a good idea (57.7%/26.9%) (Figure 5.5). However, when compared with subsequent interview data collected and categorized through questions concerning specific individual thoughts and reasoning concerning support or deterrence to the concept, it became apparent through analysis, that although the idea of a TBI-SLB had support in several specific areas, its practical implementation would prove difficult. The data analysis revealed three primary areas in which the facilitation of a TBI-SLB would encounter significant difficulties: 1) absence of standards both within and outside of specific TBI-related disciplines, 2) fiscal and revenue concerns, and 3) problems with scope/oversight.

By adhering to the direct content and deductive approach with QMT as a guideline in streaming and improving organizational processes, the three primary themes emerged early in the data collection and were codified as categories based upon consistency and response frequency throughout the remainder of the interviews. The majority of responses were related to questions concerning standards of evaluation, experience, and measurements, as well and revenue related responses. There were also additional, albeit less frequently noted responses concerning issues addressing Scope/Oversight of the proposed SLB. In addition, there were several random responses outside of these three categories with relatively low response rates that were also annotated in the graphs and charts. The first two categories (Standards and Fiscal Concerns) had the highest overall response rate in the earlier stages of the interviews and also had the highest response rate throughout the process. The Scope/Oversight category was also identified early in the data collection process and although it had a lower and less frequent
systematic response rate as the first two, it still remained constant in its response rate through the data collection process.

**Standards**

Over the course of the interview process, none of the respondents reported having any prior knowledge of the existence or concept of a TBI-SLB. Although enthusiasm was high for the conceptual creation of a TBI-SLB in terms of integrating different medical disciplines, establishing protocols and procedures, and creating a universal and interdisciplinary gold standard of TBI evaluation particularly with individuals who held PhDs and MD/PhDs (Figure 5.9), several issues and concerns arose with respect to various standards of measurement, oversight, and professional practice within these same groups. To provide a backdrop to elucidate these concerns, several examples of existing interdisciplinary TBI oversight models were examined and used as a comparison for the proposed TBI-SLB, to include the Texas Medical Board and the governor appointed TBI advisory councils that currently exist within each state (Texas Department of State Health Services, 2020; Montana Department of Health and Human Services, 2020). These boards councils, which are interdisciplinary in their composition and provide limited medical guidance of functionality to governors and other government entities on TBI-related issues are interdisciplinary in their composition(s) and have established protocols and procedures, but have no authority to make evaluate medical decisions, set standards, or perform complaint adjudications and as such have no medical or disciplinary authority.

In contrast, a state constructed stand-alone TBI-SLB, as proposed here, would have both complaint adjudication and medical disciplinary authority. Support for a unified pathway to adjudication and authority was noted by participants in some areas, predominantly through disciplinary integration, creating protocols and procedures and establishing oversight. However,
in analyzing all respondent answers, although support was evident, it was noted there would be sharp contrasts in various individual medical training and backgrounds, inherent professional guidelines based upon individual state licensure, as well as competing standards of practice. The data pointed to the possibility that these competing ideologies and variations in practice could create gaps between individual discipline specific SLBs and the proposed TBI-SLB that could create impediments to its overall mission – interdisciplinary adjudication of TBI medical complaints. As an example, a neurologist would have to adhere to a different set of medical principles and standards in diagnosing, measuring the severity and treating TBI than would an occupational therapist or a psychologist. Additionally, differing levels of research or clinical training, personal experience, and professional education would directly factor into this dynamic to include there being no systematic diagnostic tool to gauge the severity and sequelae of TBI and as such, no common or set standard in which to adjudicate a complaint.

Interviewees frequently noted that various medical systems have different and often conflicting rules and regulations overseeing a host of operational issues that can cause additional layers of disconnect and confusion. For example, a provider could practice TBI-related medicine in the federal medical system and fall under one set of rules and regulations, but also must adhere to the rules and tenets set forth by the discipline-specific SLB. If these are at odds, where does the provider fall within professional and medical ethics set forth by both entities?

Another factor that was pointed out during the interview process with a high level of frequency was the fact that a universal gold standard of measurement for the diagnosis or evaluation of TBI does not currently exist (Dutton et al., 2011). Even though many of the medical disciplines represented and interviewed had significant overlap in their fields of practice, the absence of a “gold standard” was repeatedly stated. Depending upon the discipline, different
measures are used to assess the severity and sequelae of TBI such as neuroimaging techniques, neuropsychological batteries, field screening assessments, among others. Some respondents felt that the creation of a TBI-SLB could eventually open a proverbial door to setting a “gold standard”, but it was almost universally agreed upon across disciplines that the creation of a TBI-SLB was not feasible given the absence of an agreed upon gold standard. Many felt that in the absence of a proficient measurement, it would be too difficult to cross-compare discipline specific TBI basic and training measurement standards, particularly within the realms of ongoing interdisciplinary care in different medical domains or systems that would serve to adjudicate any complaint. As an example, measuring the severity of and treating TBI, as well as overseeing subsequent complaint adjudication, would require a unified and interdisciplinary familiarity and understanding of cross-discipline concepts such as cerebral anatomy, physiology, and lifespan function that unfortunately is not currently taught or promoted in interdisciplinary cross-spectrum TBI treatment and research (Flanagan et al., 2008). Most of the respondents agreed that such familiarity does not currently exist and would hamper efforts to successfully implement a TBI-SLB.

**Fiscal Concerns**

Fiscal concerns had several positive responses but had the second largest overall negative response rate. There was some agreement from respondents that the creation of a stand-alone TBI-SLB could and would indeed streamline costs (e.g., labor, administrative, logistical). The major consensus, however, was that the TBI-SLB would not create the necessary revenue streams to maintain its existence, which would be problematic considering that some interviewees noted that in their home states of licensure, licensing boards must produce a yearly positive net income. But as the qualitative data analysis was conducted, it became apparent that
each of the medical specialties (specific SLBs) included in the proposed TBI-SLB might have to allocate revenue at times through their participation to the TBI-SLB, and not their own, thus creating a potential point of contention, if not rivalry, in creating and maintaining funding and revenue. This could possibly create friction both within and between the individual SLBs and the proposed TBI-SLB which thus dampened enthusiasm for the justification and eventual creation of a TBI-SLB.

A second and important monetary issue that was brought up frequently revolved around concerns of billing procedures. Many insurance companies have different levels of coverage and benefits ranging from availability of medical procedures to types of coverage (Krumholz, 2013). These benefits can be under different entities (private, public, etc.) and can have large variations in coverage based upon, premiums and payments (Wray et al., 2021). One factor that arose from the onset in this category concerned billing and medical coding. Coding is the medical and insurance practice of assigning treatment options or pathways based upon provider reports and diagnosis (Adams et al., 2002). Several respondents reported experiences, both directly and indirectly, with coding deviations and complaints. The consensus was that it would take a great deal of time and at great cost for a TBI-SLB to sort through the varying rules, regulations, and expectations of state, federal, tribal, and private medical entities to seek any type of interdisciplinary resolution to a complaint. Many of the respondents also agreed that even if a complaint was assigned a domain and adjudicated, the board’s decision would probably be potentially unenforceable and have no legal standing in the near term due to the competing overlap from various entities. Additionally, as noted in the data analysis, complaints adjudicated of this nature would more than likely exceed any predetermined and limited budget provided by the state for the proposed TBI-SLB.
Although lower in response frequency, Scope/Oversight was still widely viewed by many respondents to have potential areas of impact and implications for the proposed TBI-SLB. Positive responses from interviewees regarding the proposed creation of a TBI-SLB revolved around providing new and novel approaches, reductions in disparity, and the idea that its inception might create a more fair and equitable recourse or protection(s) for both providers and patients, all of which are supported in the QMT framework. However, negative responses reflected concerns about which individual (discipline) would chair or oversee the TBI-SLB and how to qualify levels of experience by profession diminished respondent enthusiasm.

Both PhDs and MDs had the highest response and proportional response rate in this area and both groups expressed doubt that a TBI-SLB could function without a central authority, or one person “being in charge.” With the different levels of medical training, experience, and current professional development, there was agreement that it would be difficult to appoint one medical discipline over another with respect to internal board hegemony and administrative functions. Even though many agreed that with proper team training and cross-discipline familiarization with the TBI-SLB’s inception, certain medical professions and individuals were likely to impose and prioritize their specific medical areas of expertise which could inherently limit avenues of recourse to resolve board-specific, internal impasses outside of adhering to doctrine, regulations, and measurement of TBI inherent in their specific medical professions. Some respondents felt that this issue could be addressed through ongoing professional development, but the likelihood that these interdisciplinary professions may not work or function in a cohesive manner together was of serious concern as it would entirely defeat the purpose behind the creation of a TBI-SLB – streamlining the process for complaints. Tied together, the
majority of respondents felt that these Scope/Oversight issues could unfortunately add another
layer of political bureaucracy and confusion to the process of complaint adjudication and would
preclude the ability for an interdisciplinary team to effectively function in concern within the
realm of a TBI-SLB.

In evaluating the overlap and relationships of the majority of responses across the three
major categories, their combined effectiveness in elucidating the potential impact of a TBI-SLB
would seem to fall short of an established tenet with the QMT framework. As described by
Thompkins (2015), “performance is enhanced by designing products and services to meet or
exceed customers’ expectations and by empowering workers to find and eliminate factors that
undermine product or service quality”. The undertaking of this research was designed to explore
the possibility of establishing or designing an operational system that would combine and
streamline existing medical knowledge and opinions. However, most professionals interviewed
felt strongly that while this was indeed an interesting concept, the diversity of medical
backgrounds, lack of universal and agreed upon standards, and pre-established oversight would
make the formulation of a TBI-SLB difficult in many areas. As summed up succinctly by one
respondent:

- Although multiple inputs could establish an effective framework to further patient
equity and fairness, different perspectives on treating symptoms and power
differential between specialties could cause problems. (Neuropsychologist, PhD)

**Limitations**

The qualitative study outlined in this paper was conducted as part of a larger, mixed
methods study, using a parallel convergent study design. As a standalone study, the design of this
qualitative arm could have had additional strength in targeted data collection using an
explanatory sequential design which is based upon using quantitative data to inform the
qualitative collection process (Fetters et al., 2013). The current study did collect relevant data in response to the research question(s) and interview questions. However, by creating and administering an exploratory survey to a targeted population before designing a quantitative questionnaire to collect data from the same population, in this case federal-level TBI researchers, information collected on the survey might generate more specific and detailed questions. This precision could have facilitated a been more precise, faster, and focused data collection process.

The target population in this study were two federal-level research organizations, CNRM and LIMBIC-CENC. The populations were considered purposive in nature as they were accessible and had the relevant professional expertise and experience. Many sample sizes in qualitative studies of this nature are considered to be insufficient as they lack size which accounts for deficiencies in generalization and validity (Vasileiou et al., 2018). The number of interviews conducted was 26, which was high enough to achieve saturation as there was no new data that was to be discovered in the data analysis (Saunders et al., 2018) and, thus, is large enough to achieve study replication. Although statistical measuring does not exist in qualitative research, the number of interviews conducted in the current study (N=26) is large enough to demonstrate rigor, credibility, dependability and confirmability. This study design did not use randomization; however, samples were chosen from two separate, but mission-related research organizations. These samples also contain a unique homogenous and heterogenous mix: homogenous in that all participants are federal-level TBI researchers and heterogeneous in that while all participants are TBI researchers, they are of different medical professions and disciplines.

A caveat to this purposive sample discussed above was the unknown nature of the participant’s levels of experience of practice and research in rural states. The demographics
clearly showed that several participants did indeed reside in or were licensed in states with large rural areas (Figures 4.3 and 4.4) and while some participants discussed challenges specific to rurality, the exact extent of their individual or aggregate professional experience as it relates to rurality was not investigated. Rurality, however, was a key component in the conceptualization and justification for the creation of a TBI-SLB, and as such the inclusion of questions targeting this rural component should have been incorporated into the interview questions to adequately capture participants rural experiences and, thus, strengthen the findings.

Another limitation was the structure of the interview questions. Although the questions themselves were able to accurately capture response data that allowed for categorization and subsequent analysis, the initial set of interview questions proved to be highly complex and made the interview process time consuming and coding and analysis labor intensive. This limitation was addressed early during the interview process as themes started to emerge and were categorized accordingly. As the interviews progressed using the deductive approach, when the interview came to a subject area of relevant interest based upon the categories identified, the interviewee was asked to elaborate on the subject of interest at hand, which led to other potential limitation(s) that revolved around the possibility of interview bias and selection bias. Subjects were chosen from a pre-identified target population based upon experience (a purposive sample) but were not randomized under the study design. To prevent against bias, the subjects were chosen from two different organizations that both were targeted and chosen for their relative experience with TBI and a degree a randomization was unintendedly factored into the interviews as the interviews themselves followed no set order of professional or discipline-specific precedence that could lead to preferential bias.
With respect to interview bias, through the semi-structured design, certain areas of interest were explored in greater detail as the interview process progressed. This increased the possibility that inconsistent questioning could occur as the interviewer and respondent may have explored certain areas in greater or less detail based upon the possibility of acquiring data under the set categories or areas of subjectivity. To account for this challenge, all interviews were attempted to be limited in duration with an effort made to allow for time on multiple topics through steering back to main topics and extensive note taking to annotate relevant time points to be revisited in subsequent transcriptions.

However, even with the aforementioned techniques implemented both directly and indirectly to minimize and prevent interview and selection bias, it must be noted that the researcher did in fact know and have a relationship with a small percentage (< 20%) of the interviewees on both a very limited personal and professional level. This was not considered an impediment as the interview questions were specific and professional in construct and delivery, notes were consistently annotated during points of interest and side bar, or personal conversation and banter, were kept to a minimum or avoided entirely due the nature of the questions and time limitations.

A last limitation was the consistent adherence to maintaining trustworthiness in the data collection and analysis. While trustworthiness of the data was maintained, the ebbs and flows of the research process created some impediments. The “audit trail” technique (Rodgers & Cowles, 1993) employed did reinforce confirmability, but excessive notes that at times became somewhat unorganized and disjointed. This was corrected by reviewing the notes post-interview, and in some cases, re-writing or correcting difficult to read scripts. These same stops helped uphold the dependability of the data as they allowed for inter and intra comparisons of certain responses.
between interviews to make sure that the questions and how they were put forth did not drift to far from the intent. This also helped eliminate bias from interviewer fatigue later in the data collection proves. Transferability was never a concern, but credibility needed a concerted effort to be maintained towards the latter interviews as, once again, interview fatigue became problematic. This was remedied by spacing the interviews far enough apart to allow for a respite between interviews. This approach facilitated a better attitude and a more friendly engagement between the interviewer and respondents that fostered open and fluid exchanges / responses that’s quality and quantity could have been challenged by apathy or lack of attention to detail.

**Conclusion**

Using a set of semi-structured interview questions, a cohort of clinicians, practitioners and researchers were interviewed from two federal-level research institutions, CNRM and LIMBIC-CENC. Three primary categories emerged after content analysis: (1) the absence of standards both within and outside of specific TBI-related disciplines, (2) fiscal concerns and revenue related issues, and (3) problems with scope/oversight. Overall, the respondents were enthusiastic about the proposed TBI-SLB. These responses supported the conceptual QMT framework that this study was built around in creating cohesion, unity of command and force, streamlined resource allocation, and improved operating systems all of which will help practitioners and complainants engage in a fair, lawful, and equitable TBI medical complaint adjudication process. However, the respondents provided a much larger margin of negative response data in these same areas during detailed interview discussions. Specifically, the absence of a gold standard of TBI diagnosis and measurement, the lack of SLB generated revenue and billing concerns, and uncertainty regarding exactly who would lead the undertaking, as well as issues concerning the synergy and experience levels between different medical disciplines. The
breadth of responses and subsequent analyses complexity ultimately hindered the idea and justification of the proposed TBI-SLB.

The descriptive statistics included show a slightly higher margin of negative responses in Standards and Revenue and an overwhelming disparity between positive and negative in Scope/Oversight. Based upon these depictions and several details drawn forth in the interview process, it is difficult to conclude that the overwhelming professional opinion of federal practitioners and researchers from CNRM and LIMBIC-CENC support the justification of a TBI-SLB at this time.
CHAPTER 5. Quantitative Analysis of Montana State Licensing Boards

Research Question #2: What is the comparative relationship between the available financial resources of all Montana SLBs vs those associated with six SLBs that represent interdisciplinary providers of TBI “TBI-specific SLBs”? What is the individual and collective relationship of Montana’s six TBI-specific SLBs in Activities, Statistics, and Complaints and how do they relate to numbers of complaints and license applications?

Hypothesis #2: Comparison of Activity, Statistics, and Complaint data from biennial reports of Montana SLBs will show financial justification for the creation of a single interdisciplinary TBI-SLB.

Purpose

The purpose of this quantitative arm of the dissertation was to explore how the costs of complaint adjudication processes initiated and overseen by the MTDLI SLBs impacted available financial resources and personnel. Specifically, the intent was twofold: (1) to compare the individual and collective financial stability of six TBI-specific SLBs versus the remaining non-TBI SLBs, and (2) to explore how the relationship of financial stability influences the number of complaints and new licensing applications.

On the basis that the representative healthcare disciplines are relevant to the diagnosis, treatment, and disability issues attributed to TBI and its associated sequelae, the following six SLBs were chosen to constitute the TBI-SLB selected for this study: 1) medical examiners, 2) occupational therapy, 3) physical therapy, 4) speech-language pathology, 5) psychology, and 6) behavioral health.

Adhering to the focus of improving quality and increasing efficiency within the Total Quality Management framework (Tompkins, 2005), it is necessary to ascertain any relationship
between revenues and expenditures of the SLBs and how they influenced increases or decreases with respect to the number of complaints and applications. Exploring and establishing a relationship in these areas serves to highlight gaps in revenues and potentially high-cost areas that can be addressed by combining the six TBI-specific SLBs into a single entity which would serve to either increase or redistribute financial resources in an equal manner and streamline costs in deficient areas to improve personnel function, application submissions, complaint reduction, performance, cohesion, efficiency, and SLB management and purpose (Miles & Huberman, 1994).

The MTDLI has compiled information on its SLBs since 2005. Its repository contains biennial Montana Governor’s Professional and Occupational Reports (accessed from the MTDLI Business Standards Division website and database) from 2005-2019. In addition to a general description of all 34 recognized State of Montana SLBs, the report provides in tabular form a breakdown of Activities, Complaint Summaries, and Statistics for each SLB. The number of complaints on licensees that are received and reviewed by the boards are also reported.

Data used in this study were extracted from reports generated between 2014-2019 (MTDLI, 2018). Specifically, the focus was concentrated on collections of expenditures and revenues (Activities) for all SLBs and the number of complaints (Complaint Summaries) and license applications (Statistics) for the six TBI-specific SLBs in Montana (MTDLI, 2018).

2 As noted in reports, “Activities” constitute inspections, audits, revenue, and expenditures; “Complaint Summaries” represent administrative actions, including license sanctioning, suspension, revocation, dismissal, investigations, or other court actions, as applicable; “Statistics” refers to license applications, renewals, and issuance.
Methods

Two sets of numerical data were chosen and grouped for statistical analysis and comparison. The first subset (Subset #1) included Activities data (revenues and expenditures) extracted from all 34 SLBs between 2014-2019. The second subset (Subset #2) included Activities (revenues and expenditures), Complaint Summaries (complaints), and Statistics (license applications) data from the six TBI-specific SLBs.

The objective driven methodology was two-fold. The first objective compared the total yearly revenues and expenditures between the TBI-specific SLBs and the total aggregate revenues and expenditures between the six TBI-specific SLBs and the remaining 28 SLBs to ascertain any observed relationships in those categories. The second objective compared revenues and expenditures, complaints, and license applications between the TBI-specific SLBs to ascertain any observed relationships in those categories as well. The analysis of this data from the SLBs drove two exploratory aims: 1) to explore correlations and associations between revenues and expenditure between all the SLBs and the TBI-specific SLBs; and 2) explore correlations between revenues and expenditures, complaints, and license applications between the six TBI-specific SLBs.

Statistical Plan

The data within the Governor’s reports (2014-2019) used in this study was determined to be nonparametric. Although population data with pooled information was collected across multiple SLBs, the data collection was not based on any one assumption(s). The numerical information and values within the Activities, Statistics, and Complaints collected on both sets of SLBs was gathered and transferred into Microsoft Excel. The generated spreadsheet was uploaded and analyzed using “R” statistical software (https://www.r-project.org/) that was
available through UM. The data were analyzed and graphed using descriptive statistics (tables, bar charts and box charts) and linear/multivariate regression modeling (scatter plots). As the data was determined to be nonparametric (continuous), closeness of measure and strength of association(s) between Activity and Statistics/Complaint variables was ascertained using the correlation coefficient ($r$).

**Results**

**SLB Intra-Activity Comparison 2014-2019**

Activity data was compared between the six TBI-specific SLBs and the remainder of the 28 non-TBI SLBs to explore differences in income and revenue. This data was analyzed with an inter-subset descriptive analysis and a linear regression analysis to ascertain significance. With the exception of a down year in 2014, where expenditures collectively exceeded revenues, collective net income by year was positive and increased almost 11-fold between 2015-2019 (Table 5.1).

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3 The Plumbers SLB had a net loss of -$3,377,963 in year 2017. This was obviously a typo as no board sustained even remotely such a drastic drop in any of the years. The Plumber SLBs Activities data was added together for all five years and divided by five. This figure was then inserted back into the data set for 2017 and used in subsequent analyzation.
Table 5.1 Net Income Between TBI-specific SLBs and Non-TBI SLBs (2014-2019)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TBI-SLBs</td>
<td>-$186,827</td>
<td>$67,231</td>
<td>$588,661</td>
<td>$519,003</td>
<td>$657,546</td>
<td>$767,940</td>
</tr>
<tr>
<td>Non-TBI SLBs</td>
<td>$1,614,487</td>
<td>$1,771,828</td>
<td>$1,393,951</td>
<td>$-2,951,685</td>
<td>$1,861,929</td>
<td>$1,664,056</td>
</tr>
</tbody>
</table>

Note. Net Income is a measure of the difference between Revenue and Expenditures. TBI-specific SLBs include the following: Behavioral Health, Medical Examiners, Occupational Therapy, Physical Therapy, Psychology, Speech Pathology; Non-TBI SLBs include the following: Alternative Health Care, Architects, Athletic Trainers, Chiropractors, Clinical Lab, Barbers, Dentistry, Electrical, Funeral Service, Hearing Aid, Massage Therapy, Nursing Home, Nursing Home, Optometry, Outfitters, Public Accountants, Engineers, Pharmacy, Plumbers, Private Security, Respiratory Care, Real Estate, Realty, Radiologic Techs, Sanitarians, Veterinary Medicine.

Additionally, when non-TBI SLBs were compared to TBI-specific SLBs with respect to overall yearly revenue, non-TBI SLBs showed some inconsistency whereas TBI-specific SLBs has mostly continued, positive revenue growth over the study period (Figure 5.1).

Figure 5.1 Total Revenue between TBI-specific SLBs and Non-TBI SLBs (2014-2019)
To test for significance, an inter-subset regression analysis was used to compare average yearly revenue and total expenditures between the 6 TBI-specific SLBs and 28 non-TBI SLBs. This model produced a very strong, positive association ($r = 0.982$) between the increase in revenues of the TBI-specific SLBs and the inconsistent growth of revenues for the non-TBI SLBs. (Figure 5.2).

**Figure 5.2 Average Yearly Revenue & Total Expenditures: TBI SLBs & Non-TBI SLBs**
Note. Across all 34 professions, there was a very strong positive linear association between average annual revenue and total expenditures. Because the relationship is so strong, we may apply to linear model to estimate the error by which any individual specialty (TBI or non TBI) yields error.

$$y = \beta_0 + \beta_1 x_1 + \varepsilon$$

$\beta_0 = -34.38$ (intercept coefficient)

$\beta_1 = 0.86$ (revenue coefficient)

**TBI-specific SLB Yearly Inter-Activity Comparison**

Activity data from the first subset was analyzed by individual year for the TBI-specific SLBs to determine comparative singular yearly levels of income (Figure 5.3).

**Figure 5.3 Net Income for All TBI-specific Professions (2014-2019)**

An intra-subset descriptive analysis table shows the yearly net income for each of the TBI-specific SLBs by year (Table 5.2). Of the six TBI-specific SLBs, only behavioral health had
a positive revenue each year. Medical examiners had a negative return in years 2015 and 2016 ($-559,547), speech pathology had two negative returns in 2015 and 2018 ($-20,794), psychology had one negative return in 2015 ($-39,346), physical therapy had the least with one negative return in 2016 ($-2,154), and occupational therapy had the most with three in years 2014, 2016 and 2017 ($-11,849). Although these SLBs had a few years of negative returns, they showed an overall increase through the six-year timeframe.

**Table 5.2 Activities for All Traumatic Brain Injury Specialty Professions (2014-2019)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Health</td>
<td>Revenues</td>
<td>$534,893</td>
<td>$553,685</td>
<td>$745,182</td>
<td>$653,971</td>
<td>$689,368</td>
<td>$746,499</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$377,808</td>
<td>$352,136</td>
<td>$588,772</td>
<td>$575,665</td>
<td>$586,400</td>
<td>$583,108</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$156,085</td>
<td>$201,549</td>
<td>$156,410</td>
<td>$78,306</td>
<td>$102,968</td>
<td>$168,391</td>
</tr>
<tr>
<td>Medical Examiner</td>
<td>Revenues</td>
<td>$1,270,653</td>
<td>$1,299,307</td>
<td>$1,913,077</td>
<td>$1,951,734</td>
<td>$2,107,362</td>
<td>$2,163,500</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$1,567,189</td>
<td>$1,562,318</td>
<td>$1,610,056</td>
<td>$1,544,470</td>
<td>$1,618,227</td>
<td>$1,668,216</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$-296,536</td>
<td>$-263,011</td>
<td>$303,021</td>
<td>$407,264</td>
<td>$489,135</td>
<td>$495,284</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>Revenues</td>
<td>$67,818</td>
<td>$67,818</td>
<td>$77,716</td>
<td>$75,975</td>
<td>$82,770</td>
<td>$86,650</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$70,692</td>
<td>$60,137</td>
<td>$79,995</td>
<td>$82,671</td>
<td>$60,146</td>
<td>$76,310</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$-2,874</td>
<td>$7,681</td>
<td>$-2,279</td>
<td>$-6,696</td>
<td>$22,624</td>
<td>$10,340</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>Revenues</td>
<td>$115,765</td>
<td>$122,595</td>
<td>$127,734</td>
<td>$137,400</td>
<td>$140,730</td>
<td>$147,960</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$100,659</td>
<td>$118,055</td>
<td>$129,888</td>
<td>$128,870</td>
<td>$125,633</td>
<td>$94,936</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$15,106</td>
<td>$4,540</td>
<td>$-2,154</td>
<td>$8,530</td>
<td>$15,097</td>
<td>$53,024</td>
</tr>
<tr>
<td>Psychology</td>
<td>Revenues</td>
<td>$96,426</td>
<td>$136,961</td>
<td>$138,990</td>
<td>$130,135</td>
<td>$159,035</td>
<td>$172,650</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$135,772</td>
<td>$91,061</td>
<td>$81,856</td>
<td>$120,339</td>
<td>$130,781</td>
<td>$166,127</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$-39,346</td>
<td>$45,900</td>
<td>$57,134</td>
<td>$9,796</td>
<td>$28,254</td>
<td>$6,523</td>
</tr>
<tr>
<td>Speech Pathology</td>
<td>Revenues</td>
<td>$60,133</td>
<td>$118,673</td>
<td>$134,698</td>
<td>$149,840</td>
<td>$84,973</td>
<td>$95,468</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
<td>$80,395</td>
<td>$48,101</td>
<td>$58,169</td>
<td>$128,037</td>
<td>$85,505</td>
<td>$56,090</td>
</tr>
<tr>
<td></td>
<td>Net Income</td>
<td>$-20,262</td>
<td>$70,572</td>
<td>$76,529</td>
<td>$21,803</td>
<td>$-532</td>
<td>$39,378</td>
</tr>
</tbody>
</table>

*Note.* Aggregate income for each SLB was calculated by taking the total aggregate differences between Revenue and Expenditures for each TBI-specific SLB between 2014-2019.

**TBI-specific SLB Inter-Activity Aggregate Comparison**

Activity data was analyzed in total yearly *aggregate* for the TBI-specific SLBs to determine comparative total levels of combined incomes (Table 5.3).
Table 5.3 *Aggregate Income among TBI-specific SLBs (2014-2019)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Behavioral Health</th>
<th>Medical Examiners</th>
<th>Occupational Therapy</th>
<th>Physical Therapy</th>
<th>Psychology</th>
<th>Speech Pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual</strong></td>
<td>$653,933</td>
<td>$1,784,272</td>
<td>$76,458</td>
<td>$132,031</td>
<td>$139,032</td>
<td>$107,298</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td>$3,923,598</td>
<td>$10,705,633</td>
<td>$458,747</td>
<td>$792,184</td>
<td>$834,197</td>
<td>$643,785</td>
</tr>
<tr>
<td><strong>Total Expenditure</strong></td>
<td>$3,063,889</td>
<td>$9,570,476</td>
<td>$429,951</td>
<td>$698,041</td>
<td>$725,939</td>
<td>$456,297</td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td><strong>$859,709</strong></td>
<td><strong>$1,135,157</strong></td>
<td><strong>$28,796</strong></td>
<td><strong>$94,143</strong></td>
<td><strong>$108,258</strong></td>
<td><strong>$187,488</strong></td>
</tr>
</tbody>
</table>

*Note.* Aggregate income for each SLB was calculated by taking the total aggregate difference between Revenue and Expenditures for each TBI-specific SLB between 2014-2019.

Medical examiners had the highest overall aggregate revenue that far exceeded all other TBI-specific SLBs ($1,135,157). Of note, although expenditures exceeded revenue for the medical examiner SLB from 2014-2015 ($-559,847), 2016 and onward produced a positive net income that only grew with each year between 2016-2019. Behavioral health came in a distant second by comparison ($859,709). Among all TBI-specific SLBs, behavioral health was the only one that yielded a positive net income each year from 2014-2019. The remaining four TBI-specific SLBs, placed in sequential order, included: speech pathology ($187,488), psychology ($108,488), physical therapy ($94,143) and occupational therapy ($28,796). All TBI-specific SLBs had at least one year where expenditures exceeded revenues but overall had smaller aggregate positive revenues in this order.

**TBI-specific SLB Statistics Comparison 2014-2019**

Statistics data was analyzed for the TBI-specific SLBs, including new applications and renewal of current licenses. When compared individually, medical examiners and behavioral health had the strongest positive growth with a tremendous increase for occupational therapy in 2019 (Figure 5.4).
Figure 5.4 Total Statistics for All TBI-specific Professions from 2014-2019

Although overall totals and growth differed between the TBI-specific SLBs, total number of cumulative statistics for the TBI-specific SLBs when combined between 2014-2019 increased by almost 50% with the largest increase between 2018-2019 (Figure 5.5).

Figure 5.5 All Statistics for TBI-specific Professions (Applications, Renewed, New)
Cumulative statistic data were also compared to total revenue and expenditure to data to observe any relationships. To test for significance, an intra-subset regression analysis was used to compare average yearly revenue and total statistic data between the TBI-specific SLBs. This model produced results suggesting a very strong, positive linear association between the increase in total number of licenses and positive revenue (r=.932) (Figure 5.6).

**Figure 5.6 Average Yearly Revenue and Total Number of Licenses Among TBI-specific SLBs**

![Figure 5.6](image)

*Note.* Values that fall above the regression line suggest that the corresponding TBI-specific SLB generates a disproportionate number of licenses based on the SLB’s total revenue between 2014 and 2019. Among the intra-subset, behavioral health represents the most prominent example.

**TBI-specific SLB Complaints Comparison 2014-2019**

Complaint data was analyzed for the six TBI-specific SLBs. When compared individually, there was a noticeable increase in complaints in 2015 for medical examiners and in
2016 for behavior health with no major increase for any of the remaining TBI-specific SLBs (Figure 5.7).

**Figure 5.7 Total Complaints for All TBI-specific SLBs (2014-2019)**

Although overall totals of complaints differed proportionally on an individual comparison between the TBI-specific SLBs, when combined cumulatively between 2014-2019, they decreased roughly 30% with the largest cumulative decrease in 2017 (Figure 5.8).
Figure 5.8 Total Complaints for TBI-specific SLBs (Revoked, Suspended, Dismissed, Sanctioned, Investigated)

To test for significance, an intra-subset regression analysis was used to compare average yearly revenue and total number of complaints between the TBI-specific SLBs. The model produced suggests a very strong, positive linear association between total decline in the number of complaints and positive revenue (\(r=0.997\)) (Figure 5.9).
Figure 5.9 *Average Yearly Revenue and Total Number of Complaints Among TBI-specific SLBs*

*Note.* Despite total revenue variable across the TBI-specialty professions (namely for medical examiners and behavioral health professionals), the total number of complaints is comparable by proportion.

**Discussion**

In this analysis, it was decided that TBI-specific SLB activities data would be compared within itself and against all of the remaining non-TBI SLBs. It was also decided that TBI-specific SLB Activities data would be compared against TBI-specific SLB Statistics and Complaint data. A determination was made to not compare TBI-specific SLB Statistics and Complaints data with overall non-TBI SLB data as the nonmedical nature of the complaints and broad and diverse requirements of the non-TBI SLB licensure processes would not meet the same criteria or medical threshold relevant in this analysis.
Activity

When the six TBI-specific SLBs were compared to the remaining 28 SLBs, Activity increased from 24% in 2014 to over 40% in 2019. Between 2014-2019, when the boards were separated, they generally produced positive yearly results with some years of negative returns. When combined between 2014-2019, both net income and net revenue had yearly positive increases to over 40% and were consistent in their association ($r = .982$).

Revenues/expenditures data for the TBI-specific SLBs between 2014-2019 was first analyzed independently. It was observed that of the six SLBs, only behavioral health had a positive income each year. Outside of a larger negative return for medical examiners in 2014-2015, the other negative returns were minimal. When compared against one another, even with the minimal losses, all of the TBI-specific SLBs had an overall positive and increased net income on average, with the exception of psychology, which while still having a positive net income, decreased over the years.

When analyzed in total yearly aggregate for the six TBI specialties, medical examiners had the highest overall aggregate income that far exceeded all other TBI-specific SLBs. Behavioral health came in second followed by speech pathology, psychology, physical therapy, and occupational therapy. When income was combined for the six TBI-specific SLBs, with exception of a down year in 2014 where expenditures collectively exceeded revenues, collective net income was positive and grew from 2015-2019 by roughly 40%. When compared against the other non-TBI SLBs, their overall increase between 2015-2019 was inconsistent.

These analyses show that each of the six TBI-specific SLBs have an individual average six-year positive revenue stream. But when combined together, they create additional income and revenue that far surpasses them individually. While practitioners covered within these SLBs
address and measure TBI in different ways, these fiscal results may be related to a commonality of certain, inter-related, and overlapping medical practices and procedures inherent in each of these disciplines, such as fees, billing requirements, standards of interdisciplinary practice, and geographical distributions of practitioners in Montana.

**Statistics**

Statistics data was analyzed for the TBI-specific SLBs which included new applications and renewal of current licenses. When compared individually, medical examiners and behavioral health had the strongest overall yearly increase. This may in large part be attributed to two factors: 1) the medical examiners SLB covers a wide variety TBI professions (neurology, radiology, internal medicine, etc.) and thus is not as “specific” as other SLBs and their representation and 2) behavioral health is comprised of over 3,000 social workers and licensed therapists from numerous disciplines (e.g., addiction, family, marriage, etc.).

It was observed that even though these two SLBs outpaced their companions in individual licensure increase, when combined with the other four TBI-specific SLBs, the total number of cumulative statistics for the TBI-specific SLBs increased by almost 50% with the largest increase between 2018-2019 (Figure 6.4). When compared against overall increases in total cumulative revenue, the association of measure was extremely high (r=.932) suggesting that the more robust the TBI-specific SLBs are in fiscal resources, the more applications are renewed or received. This may be attributed to the idea that the financial health of the boards individually or together (and possibly the geographical and diverse opportunities and offerings of Montana) may appeal to both current

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4 [https://www.socialworkguide.org/licensure/montana/]
TBI-related providers who wish to continue practicing in Montana as well as new providers who wish to apply for practice in Montana.

Complaints

Complaints data analyzed in this study consisted of the total number of individual and cumulative complaints for the TBI-specific SLBs. When compared individually, medical examiners and behavioral health each had a year of strong increase in 2015 and 2016, respectively. Reasons for this growth/profit remain unknown and bear more investigation. A surprising discovery was that although TBI-specific SLB individual complaints totals differed marginally between the TBI-specific SLBs with the above exceptions, when combined cumulatively and examined between the established 2014-2019 timeframe, complaints decreased roughly 30% with the largest cumulative decrease in 2017. The reason for this singular 2017 decrease remains unknown and also warrants further investigation. When the cumulative total was compared against overall increases in total cumulative revenue, the association of measure was extremely strong (r=.997) suggesting that the more robust the TBI-specific SLBs are in fiscal resources, the consistency in the decline of proportional complaints remains even. This may be attributed to the idea that the financial health of the boards individually or as a whole may make their organizational oversight and structure more efficient in the areas of regulation, cohesion of oversight, streamlining costs, expediency, improved services, and fairness to both the provider and the complainant all of which are key tenets supported by the QMT conceptual framework (Deming, 2018).

Limitations

Three main limitations became apparent in the analysis. The first was the accuracy of the data itself with respect to correct entry. As an example, and as noted above, the plumbers SLB
had an erroneous entry in year 2017 resulting in a massive net Activities loss. This was adjusted accordingly. Even though the adjusted figure matched well with other figures within the plumbers SLB and to other SLBs, this incorrect data entry could have occurred in other SLBs, thus skewing the data, if only marginally.

The second limitation was the challenge of framing medical examiners and behavioral health providers due to the diversity of professions. Medical examiners consist of numerous specialties, all of which may not deal with TBI. In the Governor’s report, the individual specialties were not clearly separated in any of the Activities, Statistics, or Complaint data, nor was there access to this information from the MTDLI SLBs. Furthermore, behavioral health is an umbrella term used to describe both licensed therapists and social workers. Again, although these two professions deal with issues related to TBI, it was not possible to ascertain which individuals in each profession were attributed to the Activities, Statistics, or Complaint data used in the analysis.

The third limitation revolved around the exact nature of the complaints themselves. The findings support that when Activity, Statistics, and Complaints data from the MTDLI SLBs from the years 2014-2019 were combined, the TBI-specific SLBs had an overall total increase in revenue and applications and a decrease in the number of complaints. However, it was not feasible to elucidate the exact nature of the complaints to determine whether the complaints themselves made to the six TBI-specific SLBs were specific to TBI. It is evident in the literature review and the qualitative and quantitative studies and subsequent analyses that these six TBI medical specialties have direct involvement in interdisciplinary approaches and treatment of TBI. But ascertaining the exact nature of the complaint (as it could have been made to a TBI-SLB for a nonrelated TBI issue) was elusive and the reason for the complaints remains unknown.
Although not considered a major impediment, to address this unknown in future research, it is possible that conducting a separate and parallel interview process with individuals from the six TBI-specific SLBs could serve to attain greater understanding of the number and nature of complaints that are TBI-specific.

**Conclusion**

Using the Activity, Statistics, and Complaints data from the MTDLI SLBs from the years 2014-2019, it has been shown that when combined, the TBI-specific SLBs have an overall total increase in revenue and applications and a decrease in the number of complaints. With the exception of minor variations and fluctuations in the numerical data researched within the areas of Activity, Statistics, and Complaints, as well as the lack of a fixed approach to segregating and filtering out TBI-related complaints under the purview of the six TBI-specific SLBs, it is possible to conclude that the more robust an individual and the collective TBI-specific SLBs are, the more applications they will renew or receive and the fewer overall complaints they will receive and/or adjudicate. This supports the hypothesis for justifying the creation of an interdisciplinary TBI-SLB. For example, if the six combined TBI-specific SLBs were continued in this organizational format for the 2020-2021 fiscal year and beyond, it is likely that these individual and cumulative trends will hold the same. The last comment concerning adjudication is of utmost importance as the number of adjudication processes are initiated, the greater the likelihood that additional fiscal resources will be used to seek reconciliation (Camp, 2001). In short, the more financial resources this combination model produces, the more it will attract and “cover” practitioners providing TBI-related healthcare with an overall decline in complaints to the interdisciplinary board. When these results are viewed through a conceptual QMT lens, the research supports the creation of an interdisciplinary TBI-SLB as it would increase revenue,
applications, and lower overall complaints. Improving synergy between operational systems, collaboration, and stakeholder satisfaction could eventually facilitate uniform standards of evaluation and assessment, improved provider protections, and increased equity for the complainant all of which are firmly embedded in QMTs conceptual framework and theoretical approach.
CHAPTER 6. Mixed Method Data Analysis and Results

Results from the qualitative and quantitative studies were analyzed using descriptive statistics and narrative explanation. The data was analyzed through a side-by-side joint display triangulation matrix (Fetters et al., 2013) (Figure 6.1). This method was chosen because it allowed for a clear visual illustration and comprehensive flexibility in comparing findings from two different collection methodologies (Ostlund et al., 2011; Ahuja, et al., 2015). The data integration occurred in the analysis phase of the study. Relevant areas of interest or data fit between the two studies were explored through narrative integration based upon their silence, partial agreement, dissonance, or other potential forms of convergence or divergence (Fetters, et al., 2013; Campbell, 2020). The results of this triangulation through comparative analysis and interpretation were expanded upon in a narrative approach in the discussion section.
Figure 6.1 *Data Analysis*

Qualitative

- Silence

Integration

Quantitative

- Agreement

**Standards (115)**

- 61-%
- 54+
- 62%

**Fiscal Concerns (26)**

- 22-
- 44
- 14%

**Scope and Oversight (45)**

- 81-
- 12+
- 24%

- Complaints ($r = .997$)

- SLB Revenue ($r = .982$)

- Statistics ($r = .932$)
Results

The results will contain a brief description of findings from the qualitative and quantitative studies followed by the results from the parallel convergence triangulation.

Qualitative

Interviews (N=26) were conducted with TBI professionals from CNRM in Bethesda, MD and LIMBIC-CENC in Richmond, VA. This purposive sample included individuals from at least six pre-identified TBI-related specialties: 1) medical examiners, 2) occupational therapy, 3) physical therapy, 4) speech pathology, 5) psychology, and 6) behavioral health. The interview questions were designed to elucidate professional opinion on the proposed creation of a TBI-SLB (Appendix B). Through a rigorous process of content analysis and coding, 186 responses were categorized under three primary categories: Standards (115), Fiscal Concerns (26), and Scope/Oversight (45). These categories contained sub-response categories that were assigned under one of these three primary categories based upon frequency, meaning, and support or deterrence from the idea of creating a TBI-SLB.

Standards, with the most responses (62%), also had the smallest margin in support (+) vs opposition (-) to an TBI-SLB creation with a 61/-51+ difference. This was followed Scope/Oversight (24%) with a 31/-12+ difference. The last listed category, Fiscal Concerns (14%), had a 22/-4 + difference. However, within the category of Fiscal Concerns under the sub-response revenue, 13 of the respondents mentioned revenue as a major deterrent to the possible creation and implementation of a TBI-SLB. In examining Fiscal Concerns in the side-by-side joint analysis, revenue received agreement from its quantitative counterpart while all other sub-responses received silence. When the entire categories of Scope/Oversight and Standards were compared with their quantitative counterpart, they also received silence.
**Quantitative**

The focus of the quantitative arm was to explore the relationship of revenue increases or decreases when the six TBI-specific SLBs were combined and how they related to the increases or decreases in the overall number of complaints and applications (activity) to practice within these specialties in Montana. The associations are described briefly below:

**Inter-Intra TBI-specific SLB** (*r* = 0.982). The *r* correlation coefficient indicates a very strong, positive association between the increase in revenues of the TBI-specific SLBs and the inconsistent growth of revenues for the non-TBI SLBs.

**Complaints** (*r* = 0.997). The *r* correlation coefficient indicates a very strong, positive linear association between total decline in the number of complaints and positive revenue.

**Statistics** (*r* = 0.932). The *r* correlation coefficient indicates a very strong, positive linear association between the increase in total number of licenses and positive revenue.

The *r* correlation coefficient results strongly indicate revenue as a common factor in all three comparisons. When the six TBI-specific SLBs are combined, they produce more revenue, more applications to practice in the State of Montana, and result in fewer complaints. But when compared across the side-by-side joint display matrix, Activity, specifically revenue, is the only category that receives agreement from its qualitative counterpart. Statistics and Complaints both received silence.

**Parallel Convergence Triangulation**

Using the side-by-side joint display, the quantitative side of the display clearly demonstrates that Complaints, Activities (SLB Revenue), and Statistics have a strong *internal correlation and agreement* with revenue. But unlike Activities, specifically revenue, Complaints and Statistics received silence from the qualitative arm. Conversely, in the qualitative arm of the
study, Standards and Scope/Oversight had the highest response rates and lowest levels of
deterrence in the possible creation of a TBI-SLB. But both received silence from the quantitative
arm. Fiscal Concerns, however, had the lowest response rate and the highest level of deterrence
in the proposed creation of a TBI-SLB, but was the only category to receive agreement from the
quantitative arm, specifically in the sub-response of revenue.

Therefore, the only category to display a confirmation and data fit in this side-by-side
joint display analysis from both the qualitative and quantitative arm of the studies was the sub-
category of revenue under Fiscal Concerns (Figure 6.2).
Figure 6.2 Fiscal Concerns

Revenue
- The states set fiscal priorities. (Family Medicine, MD)
- Boards need to generate revenue for the state but [boards] are sometimes resistant to change and accountability. (PM&R, MD/PhD)
- There is indeed a benefit to interdisciplinary centralization, but the potential loss of jobs and revenue will be tough to overcome for many states. (Physiatrist, PhD)
- Funding for training in this model is key...money is key! But where will it come from? (PM&R, MD)

Billing
- Certain insurance providers will only pay for certain tests. Compound that with the lack of specialists required for TBI in some states and you see the problem. (Psychologist, PhD)
- In a lot of instances, third party payers do not cover certain tests so patients might be referred out and have to cover their own fees thus not getting care or treatment... add a lack of communication between providers, and you could get several complaints. (PM&R, MD)
- There could be too many standards in play... would need to stay board specific. (Neurosurgeon, MD)
- By profession, there are very different perspectives on injury mechanisms and what is considered to be a ‘good outcome’... this may push the need and use for specific boards as opposed to an interdisciplinary board. (Psychologist, PhD)
- With multiple payer system in play that operate differently based up upon funding— university, VA and private— the implementation of such a board may get them on the same page and by extension, cut billings costs to the patient. (Neuropsychologist, PhD)

Streamline Costs
- With multiple systems in play and the possible monetary funding overlap due to lack of organization and communication, this model could provide services that might streamline costs. (Neuropsychologist, PhD)
- Although this is a longshot, the upside might be adding another regulatory layer [which could add more bureaucracy] that could not only track funding, but patient safety. (PM&R, MD)
CHAPTER 7. Discussion

The side-by-side joint display and narrative approach used in the data analysis provided a clear and fluid visual and narrative conceptualization to seek and identify confirmation (agreement) or dissonance (silence) in comparing the qualitative and quantitative findings. In the qualitative study, professional opinions concerning fiscal issues surrounding the consistency and productivity of revenue streams were the only data generated that met with agreement from the quantitative study. Conversely, the quantitative analysis demonstrated that when these six TBI-specific SLB specialties are combined into one entity, a TBI-SLB, the revenue increases exponentially thus finding agreement with the revenue concern identified and categorized in the qualitative study. When Complaints and Statistics were factored in the quantitative analysis using multivariate regression, it was shown with extremely high correlation that as revenue increased, the number of complaints declined and the number of applications to practice medicine in one of the six identified specialties increased. This increase in financial health, complaint reduction, and increase in practicing specialized medicine in Montana could improve organizational oversight and structure, which in turn could theoretically create more efficiency in areas such as board regulation, larger revenue streams, streamlining complaint expediency, improved services, and increased interest to practice in Montana. All of these areas would improve existing circumstance for SLBs, patients, and providers which are key tenets supported and in line with the QMT conceptual framework (Deming, 2018).

As noted, Fiscal Concerns, specifically revenue, was the only set of data to find agreement between both the qualitative and quantitative studies. While revenue did find agreement, it was the smallest category response rate to achieve agreement. However, the larger numerical response rates in the qualitative study in the categories of Standards and
Scope/Oversight overshadow this fact. Interestingly, it should be noted that by following the convergent parallel design, the researcher did not search for any quantitative data contained in the Governor’s reports concerning issues related to Standards or Scope/Oversight. These categories were generated solely from the qualitative data collection and analysis.

In the quantitative data collection and analysis, Complaints and Statistics (applications) had a high correlation with Activities (revenue) but drew silence from their qualitative counterparts. This could also be considered intriguing as the researcher did not frame any questions in the interviews concerning applications to practice medicine. Although medical complaints were discussed in some interviews, the response rate was less than minimal and did not rise to the level of a sub-category or category. Topics concerning applications receive no responses. As highlighted, Complaints and Statistics had dissonant findings in the side-by-side joint display and analysis. However, their consistent and higher response rates could address the need for further research in these functional areas concerned with creation and possible implementation of a TBI-SLB. Future research in these areas could be the development of questionnaires targeting professional opinion about Standards, Scope/Oversight, Complaints, and applications formed from the established concept that a TBI-SLB does indeed function in a way that increases revenue and interest in practice while reducing complaints.

Limitations

Data collection driven by the chosen parallel convergence design was done simultaneously over the course of several months. This collection process was executed independently for both study arms per the study design. As a mixed methods study, the design of this study could have had additional strengths in targeted data collection using a sequential explanatory design which is based upon using quantitative data to inform the qualitative
collection process. Specifically, using this methodology to create more targeted interview questions (Fetters et al., 2013) would allow the researcher the ability to more accurately capture professional opinion and individual rural practice and research experiences. By creating and administering an exploratory (explanatory) survey to a targeted population before designing a qualitative questionnaire to collect data from the same population(s), information collected on the survey might generate more specific and detailed questions. This precision could have facilitated a more precise, faster, and focused data collection process resulting in a broader and more encompassing professional and demographic analysis.

This first limitation directly impacted the second. The qualitative target population in this study were two federal-level research organizations, CNRM and LIMBIC-CENC. The populations were considered purposive in nature as they were accessible and had the relevant professional expertise and experience, but a limitation was the structure of the interview questions. The questions themselves were able to accurately capture response data, but the amount and variability of the data was enormous to include a lack of a rural collection focus. If the questions had been more focused and informed, the eventual coding and categorization of the responses would have been less time consuming and more efficient. Such an approach would also serve to facilitate data specific to a participant’s rural experience. If another mixed methods design was explored, as mentioned above, and possibly used, the questions could have been more focused thus generating more precise data that could find more agreement in the subsequent side-by-side analysis.

Maintaining the integrity of the research throughout the process was also a limitation in that it required an exceptional amount of time and attention to detail. During all phases of the qualitative and quantitative data collection and mixed methods analysis, the rigor and
trustworthiness of the research were maintained through a continuous focus in four areas: confirmability (objectivity), dependability (reliability), transferability (external validity), and credibility (internal validity). Confirmability was maintained by using an “audit trail” in the qualitative arm of the study (Rodgers & Cowles, 1993). Throughout the course of the interview process, extensive fieldnotes were taken that recorded not only specific data points and areas of emphasis, but also personal thoughts and observations as well as ideas on how to proceed with data collection, analysis, and interpretation as new data and information became available. Objectivity was achieved in the quantitative arm through the use and analysis of recorded government open-source material.

Dependability and reliability were achieved through occasional stoppages during research progress and by comparing current data collection and analysis methods against the original proposal/plan, against established peer-review articles and techniques, and against themselves for consistency in the collection and analysis methodology in both the qualitative and quantitative arms of the study (Korstjens & Moser, 2018).

Transferability was maintained in the qualitative arm through the inclusion of a broad scope of TBI researchers, a detailed description of the interview questions, listed methods used in data transcription and a succinct description of the participants research organizations. This same research approach and data collection process could be used to gauge opinion from other TBI-specific research organizations or possibly when examining other public health issues that may require SLB consolidation. External validity was maintained by using a selected sample (2014-2019) of quantitative data from the Montana Governor’s Professional and Occupational Reports. Another data sample from these same reports from a different time frame could be substituted as needed to replicate the research and results.
Lastly, credibility was established and maintained through the use of a mixed methods parallel convergent study design and triangulation. This design facilitated an open and fair exchange of information and intent in the interview process. This design also brought strength to the study by targeting two different, but similar, research populations for the interviews. These populations had both a degree of homogeneity in that the target populations were TBI researchers and a degree of heterogeneity in that these same researchers help different, yet related, fields of TBI specialization and expertise. Internal validity was achieved through analyzing a sample of open source and recorded government documents. This “triangulation” of methods and sources (Noble and Heale, 2019) facilitated a data collection and analysis effort that produced large, robust, and detailed amounts of unbiased data gathered from professionals in various fields of TBI research as well as quantitative data extrapolated from government sources.

Conclusion

A qualitative data set was generated and collected using a set of semi-structured interview questions that gathered the professional opinion of a cohort of TBI clinicians, practitioners, and researchers from two federal-level research institutions, CNRM and LIMBIC-CENC, concerning the possible creation and implementation of a stand-alone interdisciplinary TBI-SLB. Based on the response data from these interviews, three primary categories emerged after analysis that could either hinder or support this endeavor: (1) Standards, (2) Fiscal Concerns, and (3) Scope/Oversight. Specifically, negative feedback outweighed positive feedback in areas concerning the absence of a gold standard of TBI diagnosis and measurement, the lack of SLB-generated revenue and billing concerns, and uncertainty regarding exactly who would lead the undertaking, as well as issues concerning the synergy and experience levels between different medical disciplines.
A second quantitative data set was collected and analyzed from Activity, Statistics, and Complaints data from the Montana Governor’s Professional and Occupational Reports from the years 2014-2019 to determine the feasibility of combining six existing TBI-specific SLBs into a standalone TBI-SLB. Using linear/multivariate regression modeling and descriptive statics, it was shown that when combined, the TBI-SLB would result in an overall total increase in revenue and applications to practice specialized medicine and a decrease in the number of complaints, although the TBI-specific nature of those complaints remains unclear.

A triangulation of the two data sets was conducted using a side-by-side joint display analysis to examine the data for points of confirmation or dissonance to determine if there was a point of consensus or agreement between the datasets that might justify the creation of a TBI-SLB. Through the analysis, it was discovered that, with the exception of revenue, there was a lack of agreement in all areas explored through the joint side-by-side qualitative and quantitative comparison. With the agreement in revenue, it would seem that this area would be a solid starting point for future research. However, larger areas of silence discovered in cross-data comparison in other areas such as Standards and Scope/Oversight would indicate that future exploratory research must be conducted in these areas as well before proposing the creation and establishment of a TBI-SLB. Therefore, in light of these findings, the researcher cannot conclude there is a feasibility or justification for the creation and possible implementation of a TBI-SLB at this time. More focused research is indicated in this area.

By adhering to QMT as a conceptual framework to guide this study, the quantitative exploratory research undertaken revealed several synergistic operational functions that would support the TBI-SLB creation within the tenets of QMT. The quantitative research also discovered a series of impediments to combining the six state-based SLBs into one TBI-SLB that
could possibly be improved through a QMT framework with additional study and research. The qualitative research-generated data revealed variances and differences of personal and professional opinions, both positive and negative, in several areas essential to the potential justification and creation of the proposed TBI-SLB. Taken together and examined in the side-by-side analysis through a QMT lens, the potential to improve systems, streamline costs, and create pathways to clarity and resolution for both patients and providers became evident and bears further exploratory study.

Recommended next steps are to further investigate these research questions with a study based upon an explanatory sequential design in which two quantitative surveys would be created to help target a more specific set of qualitative questions. Both surveys would contain open-ended and close-ended questions designed to collect more specific information relevant to the participants opinion and experiences in the next stage of research (Conner & Reimers, 2019). The first survey would be administered to a cohort of similar TBI federal or state-level clinicians, researchers, or practitioners and would include an additional focus on rural experiences, views about practicing or wanting to practice in rural states, as well as views on various and current TBI-specific SLBs and the proposed TBI-SLB adjudication processes. The second survey would be administered to six current TBI-specific SLB board members within the state of Montana with an additional focus on the nature and number of TBI complaints reviewed by the six TBI-specific SLBs, views on standards of diagnosis and measurements of TBI, and views of experience, leadership, and protocols within their relative boards.

Upon the completion of data collection, these surveys would be used to inform a restructured set of the semi-structured interview questions based upon the response data. These questions could then be used in additional interviews from both groups listed above to gather
professional and personal opinion in more targeted subject areas. In this way, these data
collection tools would be more focused and more specific in capturing relevant data that could
then be compared through a joint-side-by-side display on which additional points of
convergence, divergence, agreement, or silence could obtained for further analysis in the
justification and potential creation of a TBI-SLB.
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APPENDIX A: University of Montana IRB Approval

UNIVERSITY OF MONTANA

INSTITUTIONAL REVIEW BOARD
for the Protection of Human Subjects in Research
FWA 00000678
Research & Creative Scholarship
Interdisciplinary Science Building 104
University of Montana
Missoula, MT 59812
Phone 406-243-6672

Date: July 14, 2021

To: Dr. Char Gatlin, Student Public Health
   Dr. Catherine Off, Speech, Language, Hearing, and Occupational Sciences
   Dr. Tony Ward and Dr. Gilbert Quintero, Public and Community Health Sciences
   Dr. Rich Bridges, Structural and Functional Neuroscience
   Cindi Laakos, Neural Injury Center

From: Paula A. Baker, IRB Chair and Manager


Your IRB proposal cited above has been APPROVED under expedited review by the Institutional Review Board in accordance with the Code of Federal Regulations, Part 46, section 110. Expedited approval refers to research activities that (1) present no more than minimal risk to human subjects, and (2) fit within the following category for expedited review as authorized by 45 CFR 46.110 and 21 CFR 56.110:

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

A waiver for the obtaining of written informed consent is granted for this project, as verbal consent will be obtained, and the following conditions apply:

1. Participation involves no more than minimal risk to the subjects; and
2. No procedures are involved for which written consent is normally required outside of the research context.

There is no expiration date on this approval (per revised federal regulations effective 1/21/2019). However, you are required to notify the IRB of the following:

Amendments: Any changes to the approved protocol, including the addition of any new research team members, must be reviewed and approved by the IRB before being made. Amendment requests must be submitted using Form RA-110.

Unanticipated or Adverse Events: You are required to timely notify the IRB if any unanticipated or adverse events occur during the study, if you experience an increased risk to the participants, or if you have participants withdraw or register complaints about the study. Use Form RA-111.

Human Subjects Protection Training: As the Principal Investigator(s), it is your responsibility to ensure that the training certificates of all research team members are current (within 3 years) throughout the duration of the project.

This approval only applies to this specific project and may not be extended to any other projects, no matter how similar. Separate IRB applications must be submitted for each separate project.

Please contact the IRB office with any questions at (406) 243-6672 or email irb@umontana.edu.
The University of Montana-Missoula
Institutional Review Board (IRB)
for the Protection of Human Subjects in Research
AMENDMENT REQUEST

Email this request as a Word document to: kathy_klein@umontana.edu, or provide a hard copy to the IRB office in the Interdisciplinary Science Building, room 104. NOTE: Submission of this form from a University email account constitutes an individual's signature.

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**Project Title:** Traumatic Brain Injury: An Interdisciplinary Approach to Healthcare Outcomes

**Signature:** CBG, L. G.

**Date:** 09/01/11

**Address:** CBG, L. G.

**Phone:** 406-243-1104

**Cell Phone:** 703-781-5997

**Office Location:** A112

**Department:** Public Health

**Faculty Supervisor:** Catherine A. Off

**Signature:** Catherine A. Off

**Phone:** 406-243-1104

**Email:** catherine.off@umontana.edu

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**IRB Determination:**

- Approved by Exempt Review, category #
- Approved by Expedited Review, category #
- Approved by Administrative Review
- Full IRB Determination
  - Conditional Approval (see email) - IRB Chair Signature/Date: 11/10/11
  - Conditions Met
  - Randomized Proposal (see email)
  - Risk level: Minimal
  - Disapproved (see email)

**Final Approval by IRB Chair:**

- Date: 10/3/11
- Expires: N/A
APPENDIX B: Interview Question Set: CNRM and LIMBIC-CENC

1. What is your educational and professional background? What is your primary focus within your field of practice/research and are you currently seeing patients outside of a clinical research setting? In which state(s) are you licensed to practice?

2. How many years have you been in practice? And how many of those years were solely dedicated to research? Who has been the primary funding entity for your research (academia, DoD, NIH, etc.)?

3. Has most of your research predominately focused on a TBI population? Aside from the obvious fact that TBI has been identified as the signature injury of our recent conflicts, is there another reason why the military and veteran populations are often targeted in research? How does this research ultimately translate to civilians?

4. How would you say clinical practice, every day, if you will, differs from seeing patients in or outside a research setting?

5. Within CNRM/LIMBIC, you hold the position of [position]? What are your primary responsibilities and what sparked your interest in joining the center?

6. As we all know, the research arms here at CNRM/LIMBIC are tied into the goal of creating a better understanding and facilitation of treatments for TBI. To that end, what is the composition of your research team? Specifically, what type of disciplines and backgrounds are at the table either specific to your team or to CNRM/LIMBIC as an entity? Has it always been this way?

7. TBI is a complex injury that can manifest itself across numerous domains to include both neurologic and non-neurologic complications. And with that, strong plans of care necessitate involvement from multiple disciplines, such as neurology, speech pathology, occupational and/or physical therapy, etc., depending upon the unique presentation of the patient. Can you comment on the strengths and limitations associated with a multidisciplinary approach to patient management and/or research?

8. Could you recommend any multidisciplinary strategies that might strengthen these approaches?

9. While there is overlap between many of these needed, if not required specialties, there remains an individual focus between them? As an example, psychology versus psychiatry versus neuropsychology? Would you briefly clarify as to the differences and even similarities in your discipline, and say, another one that could be deemed similar in nature? How may it affect the assessment of TBI?

10. Given that there are several specific yet overlapping practices involved, do you recall an instance when there has been incongruence or disagreement between specialists as it relates to management strategies of an individual patient with TBI? Do differences in opinions among specialists affect the patient? How?
11. In such instances, how would a patient seek clarification or rectification when there are discrepancies among providers of different disciplines?

12. Given what we have discussed, if we were to create a multidisciplinary oversight board at a state level to adjudicate TBI related complaints, in your mind, what would be a strong interdisciplinary board composition to address this complexity of the complaint process?
## APPENDIX C: Wall Chart

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*Note: The chart continues with similar columns and values, providing a comprehensive view of the data.*