

Review Article

Teamwork in skull base surgery: An avenue for improvement in patient care

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Abstract

Background: During the past several decades, numerous centers have acquired significant expertise in the treatment of skull base pathologies. Favorable outcomes are not only due to meticulous surgical planning and execution, but they are also related to the collaborative efforts of multiple disciplines. We review the impact of teamwork on patient care, elaborate on the key processes for successful teamwork, and discuss its challenges.

Methods: Pubmed and Medline databases were searched for publications from 1970 to 2012 using the following keywords: “teamwork”, “multidisciplinary”, “interdisciplinary”, “surgery”, “skull base”, “neurosurgery”, “tumor”, and “outcome”.

Results: Current literature testifies to the complexity of establishing and maintaining teamwork. To date, few reports on the impact of teamwork in the management of skull base pathologies have been published. This lack of literature is somewhat surprising given that most patients with skull base pathology receive care from multiple specialists. Common factors for success include a cohesive and well-integrated team structure with well-defined procedural organization. Although a multidisciplinary work force has clear advantages for improving today's quality of care and propelling research efforts for tomorrow's cure, teamwork is not intuitive and requires training, guidance, and executive support.

Conclusions: Teamwork is recommended to improve quality over the full cycle of care and consequently patient outcomes. Increased recognition of the value of an integrated team approach for skull base pathologies will hopefully encourage centers, physicians, allied health caregivers, and scientists devoted to treating these patients and advancing the field of knowledge to invest the time, effort, and resources to optimize and organize their collective expertise.

Key Words: Multidisciplinary, neurosurgery, outcome, skull base, teamwork

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INTRODUCTION

Skull base surgery, as a subspecialty including open and endoscopic approaches, continues to evolve, favoring minimal access approaches in order to reduce surgical morbidity and mortality, preserve neurological function, as well as cosmesis.^[3,4] Using the most direct and least destructive corridor, or combination of corridors, is paramount to the minimal access concept.^[7,18,30,42] However, favorable outcomes in patients afflicted with skull base pathologies are not only due to meticulous surgical planning and execution, they are also due to the collaborative efforts of numerous medical specialties and allied healthcare givers.^[29] Indeed, contemporary health care requires a diverse team of professionals to optimally address all patient's needs at all stages of his/her care, including a variety of surgeons such as neurosurgeons, otorhinolaryngologist-head and neck surgeons, maxillofacial surgeons, plastic surgeons, neuro-ophthalmologists, as well as pathologists, endocrinologists, medical and radiation oncologists, neuroradiologists, interventional neuroradiologists. Other professionals including psychiatrists, physiotherapists, occupational therapists, speech and swallow therapists, nursing, social worker are adjunct to the care of patients and their return to a normal life. Furthermore, the advent of personalized disease treatment has also introduced various types of scientists and clinical trial assistants to the team, propelling translational basic research and aiming to advance the overall field of knowledge on skull base pathologies.^[27,31]

To date, various groups have published their team approach or clinical experience regarding the treatment of specific skull base entities.^[41,46] The lack of literature addressing the impact of multidisciplinary work on patient outcomes during the treatment of skull base pathologies is somewhat surprising given that most of these patients receive care from multiple specialists. Interestingly, head and neck surgeons have been visionary in gathering this data for head and neck cancers and pushing this concept forward.^[19,44,49]

Through concrete examples of multidisciplinary work, this manuscript reviews the impact of teamwork on care for patients afflicted with skull base pathologies, highlights the critical concepts of teamwork, and discusses its challenges and future avenues. Organizing healthcare over the full cycle of care of a particular condition (e.g., cancer) has been found advantageous on multiple levels; thus, this review will emphasize its importance.^[15,36]

TEAMWORK: A NECESSITY

Physicians have traditionally been viewed as providers of medical services, either during an acute illness or regularly in the context of chronic conditions. However, their role

is expected to go beyond the delivery of medical services in their area of specialty. Patients rely on their physicians to oversee the quality of services delivered at all levels of the pyramid of care, for acute and chronic conditions. Patients' outcomes, defined as survival and degree of recovery based on quality of life indicators, progress of recovery, and sustainability, also relies to various extents on their care team.^[15,35] However, under our current medical system, which encourages subspecialization in specific fields such as skull base surgery, it is not realistically possible for a single physician to provide holistic care. It is critical that multiple disciplines work together in order to pool skills, experience and knowledge, and ultimately yield the best overall patient outcome.^[28,39] Indeed, multidisciplinary work benefits the patient and the entire team with the additive value of the combined scope of knowledge and judgment capacity of each member, thus clearly advantageous over the solo and isolated practice.

CONTEMPORARY EXAMPLES OF TEAMWORK

Different professions and specialties work together at multiple stages of a patient's care plan: Case review sessions such as tumor boards, multidisciplinary clinics, multidisciplinary surgeries, care coordination meetings, etc.^[22] In many fields of medicine there have been collaborations between medicine and surgical specialties, for example, the cardiologist working with the cardiovascular surgeon, or the gastroenterologist, endocrinologist, or nephrologist working with the general surgeon. In addition, there are examples of subspecialties within one surgical specialty that work closely together such as epilepsy and stereotactic functional neurosurgery. Despite the fact that each specialty remains within its boundaries, open dialogue and exchange of each team member's knowledge, skills, and experiences, clearly has the potential of benefitting the patient's welfare.^[12,22]

Multidisciplinary case reviews or tumor boards

Lutterbach, *et al.* published the only study to date assessing the efficacy of a newly founded brain tumor board at their institution.^[26] They showed that the recommendations made by a group of experts from multiple disciplines specialized in brain tumors, including gliomas, brain metastasis, and skull base tumors, are more likely to be implemented. Indeed, 91% of the recommendations were realized within 3 months.^[26] They emphasize the importance of tracking data and quality control of the team's structure, procedures and realization of recommendations.

Wheless, *et al.* prospectively investigated the impact of the multidisciplinary tumor board in diagnosis, staging, and treatment plan for patients with head and neck tumors.^[49] They found that approximately 27% of patients (24% of malignancies and 6% of benign tumors) with newly diagnosed head and neck tumors

had a change in diagnosis, staging, or treatment plan.^[49] Friedland, *et al.* analyzed the difference in outcome and survival data between patients with newly diagnosed head and neck cancers managed by a multidisciplinary team and those managed by individual disciplines.^[19] Although no significant difference in outcomes was observed for stages I-III, there was a statistically significant difference in survival for stage IV patients managed by a multidisciplinary team. Synchronous chemotherapy and radiotherapy was more frequently coordinated for patients with positive nodes when managed by the multidisciplinary team, whereas radiotherapy alone was recommended in the nonmultidisciplinary group.^[19]

Overall, multidisciplinary case reviews and tumor boards are being recognized by many health care systems as central to improve patient safety, patient care and outcomes.^[39] The United Kingdom National Health Service has led the way in this endeavor. The Calman-Hine report published in the mid-1990s was a call for change in the management of cancer care in the United Kingdom.^[10] In order to address variable access to specialist care, inadequacies in cancer care, disjointed referral system, large variations in individual treatments, doctor and hospital volumes, the report proposed concentrating care into the hands of site-specialist multidisciplinary teams. The data collected subsequent to this national effort is being reviewed, audited, and validated for multiple types of cancers.^[47] Studies in lung, breast, colorectal, and genitourinary cancers have documented the positive impact of multidisciplinary team meetings on treatment planning and patient outcome.^[1,8,14,24,33,45] Data regarding the impact on brain tumor and skull base pathologies remain awaited.

Multidisciplinary clinic

Traditionally, when the opinion of multiple disciplines was needed to establish a plan, patients had to entertain serial individual consultations with each specialist, sometimes weeks or even months apart. Recently, some centers have innovated in coordinating a “one-stop” service, with all consultations occurring as part of a single appointment or multiple appointments on a single day.^[22] Sadiq, *et al.* organized a “one-stop” multidisciplinary facial nerve clinic with attending consultants from ophthalmology, otolaryngology, plastic surgery, and physiotherapy.^[38] All consultants would see the patient together and each one would cover specific aspects of history and examination pertinent to their management. By combining the presence of multiple consultants, they save on cost and time associated with an average of 5.1 visits (325 miles and 8 hours travel time) for each patient.^[38] Starmer, *et al.* assessed the impact of a multidisciplinary clinic on patient compliance to care plan.^[44] They observed that patients evaluated in a multidisciplinary clinic were more likely to comply with speech and language treatment recommendations.^[44] The creation of a multidisciplinary

clinic instead of simply coordinating different clinics during the same visit facilitates communication between specialists and allows all involved specialists to learn from each other. In addition, offering a one-stop service prevented coordination issues between the different medical teams, prevented delay between various appointments, reduced cancellations, optimized cost effectiveness, and improved efficiency and importantly patient satisfaction. It reinforces the message that the team works as a whole with the patient to obtain the best outcome.

Multidisciplinary surgery

Skull base surgery, as a subspecialty, has evolved thanks to the close collaboration between surgical specialties, which inspired refinement of conventional approaches and conception of new procedures. Resection of vestibular schwannomas extending from the internal auditory canal to the cerebellopontine angle is a well-known example of interdisciplinary surgery (neurosurgery and otorhinolaryngology), where each specific pathoanatomical step is performed by the surgeon best acquainted with the regional particularities.^[41,46] Endonasal endoscopic management of skull base lesions is another example where the collaboration of otorhinolaryngologist-head and neck surgeons and neurosurgeons is important. The team learns to work together on simpler cases and progressively tackles more complex skull base cases with intradural extension.^[34,43] In open and endoscopic approaches, improvement in the reconstruction of skull base defects has played a key role in the management of complex skull base lesions, supporting extensive transcranial and endoscopic endonasal approaches, reducing life-threatening complications and optimizing cosmetic results.^[21,23,51] The difficulty of quantifying the benefit of collaborative surgical experience is demonstrated by the absence of objective data in the literature.

CRITICAL CONCEPTS IN TEAMWORK: TEAM STRUCTURE AND PROCESSES

Multidisciplinary teams seek an efficient and productive way to achieve the goals set forth.^[28] Xyrichis and Lowton reviewed potential factors that inhibit or facilitate multidisciplinary work.^[50] They found two major themes that had a significant impact on teamwork.

Team structure

The first key concept is team structure: A good structural organization is essential to the success of a multidisciplinary team.^[50] Team size and composition should be dictated by the diversity of professionals required by the patient's care. As such, teams with greater occupational diversity reported higher overall effectiveness. In addition to team member diversity, identifying a team leader is essential.^[17] Lack of leadership within a team predicted lower levels of team effectiveness and was associated with poor quality teamwork.^[9] In the context of multidisciplinary

teams caring for patients with skull base pathologies, the leader should be a member of the surgical team, as surgeons are best suited to coordinate treatment planning, perioperative management and posttreatment care. Geographic proximity among the team members enhances information transactions, facilitates communication, and increases personal familiarity.^[13,32]

Team processes

The second important concept is team processes. A well-established procedural organization is important for the effective functioning of the group.^[50] Regular team meetings enable members to update the team on achievement of goals and the proposal of new ones. Regular meetings allow clarifying the roles and responsibilities of each healthcare provider in any multidisciplinary endeavor.^[37] In addition of their responsibility toward the patients, having to report to a team of colleagues stresses the importance of obtaining results within set time goals. Team members should have established means of communication, including verbal or written contacts, with other members. Multidisciplinary communication has the potential to encourage collegial learning, nourish respectful discussions on divergent views, support new working relationships, and improve patient welfare.^[28] In order to improve a team's performance, a regular audit process should be established with resultant effective and constructive feedback.^[26,47] Performance and outcome measures can be compared with historical data or national standards.^[47] At the end of an audit process, members should be encouraged by the team leadership to develop new tools to optimize their efficiency. As such, it is not only important to create multidisciplinary teams to take care of patients with skull base lesions, it is crucial to support the existing teams and facilitate their maturation on working harmonically together. Organizational support is essential for the progressive development and continuous maturation of a team.^[16]

ADVANTAGES OF MULTIDISCIPLINARY TEAMS

The most important advantage of a multidisciplinary work force is the improvement of the overall value of care, defined as achievement of the best outcome as efficiently as possible for patients afflicted with complex pathologies.^[15,35] Multidisciplinary teams use the available resources with great efficiency by reducing duplication in a patient's care, by sealing potential gaps in care management, and by decreasing the risk of errors given the use of protocols accepted by members of the team. Management protocols and clinical pathways have helped to streamline the clinical work-up, treatment, and follow-up.^[5,11,25,48] Although these tools have helped standardize the more routine aspects of this patient population care, they certainly do not preclude personalized care. In addition, healthcare providers participating in multidisciplinary teams also recognize

benefits including confidence and satisfaction in rendered care and increased job satisfaction. Any inadequacy in the care for complex skull base lesions or unequal access to centers with expertise and multidisciplinary teams can be addressed by the use of teleconferencing.^[49] Other health care organizations have stated that the reorganization of services and implementation of multidisciplinary teams may result in centralization of cancer services.^[29,34,47] High-volume providers of specialized care often have superior outcomes; however, the current healthcare system does not necessarily direct patients with certain conditions to such centers.^[20,29,40]

CHALLENGES FOR MULTIDISCIPLINARY TEAMS

Challenges of multidisciplinary teamwork

Although a multidisciplinary team approach seems intuitive to optimally manage patients with skull base pathologies, establishing this practice organization, maintaining it, and assuring its progress can be challenging. Physicians used to working with a "subspecialty silo mentality" may not have incentives to change their traditional work habits. Multidisciplinary teamwork calls for interaction between team members beyond simple referrals and reading consultation notes. Some physicians may find that reviewing cases during a weekly or monthly multidisciplinary meeting interferes with their clinic and surgery schedule workflow. They may also be reticent to discussing their patients in tumor boards or scheduling patients for multidisciplinary clinics if this implies sharing some of their clinical decision making with other team physicians. Payment differentials have potentially discouraged some physicians in engaging in team work. Various payment scenarios could potentially represent financial incentives for physicians to become involved.

Ideally, team members' recommendations should be founded on evidence-based medicine and available practice guidelines. While most patients will not be controversial as to their optimal management, some cases can be treated by two or more surgical approaches and/or nonsurgical therapies. Differences in opinions among team members stimulate discussion and may shed light on alternative treatment avenues not considered by some team members. Patients should be informed of consensus decisions but also of divergent opinions if appropriate. Overall, the success of multidisciplinary team work depends not only on the individual physicians' commitment but also the visionary support of the team leader and the institution's administration.

Learning to work as a team and integrate new members

Recent data has clearly shown that teamwork training processes improve system performances.^[2,6] To date, there

are numerous methods to teach teamwork including Crew Resource Management, team STEPPS, and Observational Teamwork Assessment for Surgery Systems.^[2] The organization must support the culture of teamwork and facilitate the participation in leadership, communication, and teamwork seminars.^[50] Investment in teamwork training is important since teamwork is not necessarily included in allied health care training or in medical training. Beyond teamwork training sessions, social activities should be coordinated in order to favor interpersonal ties between members and to facilitate a sense of belonging to the team.

The multidisciplinary team will be called upon to change and adapt as new members will need to be included as the field of skull base surgery progresses.^[34] For example, knowledge of the anatomy has allowed surgeons to safely expose the internal carotid artery during expanded endonasal approaches. This requires the involvement of an endovascular neurosurgeon or neurointerventional radiologist to be part of the extended members of the team, should an internal carotid artery injury occur and endovascular management be required. Another example is the growing use of technology in the operating rooms. In addition to the collaboration of specialist in neuronavigation and neuromonitoring, the use of robotics will become more popular, introducing biomedical engineers to the team. Last, basic researchers and clinical trial assistants may also be more commonly integrated to the multidisciplinary team as the molecular signature of each specific skull base pathology is used to help guide subsequent adjuvant treatments.^[27,31] Teamwork may also lead to the evolution of new workforce roles, developed through identification of service system gaps or new service requirements such as for telemedicine conferences.

Education and research

Multidisciplinary teams should act as educational resources, encouraging team members to contribute to continuous medical education in their respective disciplines. Team members must keep up to date in their own field and educate their respective professional communities on state-of-the-art practices. Although members currently possibly attend to their annual specialty meetings, a symposium on treatment of skull base pathologies is beneficial. This multidisciplinary meeting stimulates members to show their achievements and establish new collaborations. It is a forum where all disciplines are recognized as an active part of the patient's care over the full cycle of care. In the near future, international multidisciplinary meetings specific to a medical condition or subspecialty may become a key element to improving holistic care. These meetings should also implicate researchers working on clinical and/or basic science projects. Exchange of knowledge among specialists devoted to the care of specific pathologies fuels research ideas and opportunities.

In summary, a multidisciplinary team approach is essential to optimally manage patients with skull

base pathologies and further improve outcomes. Such collaboration is essential to help fully integrate clinical care, basic and translational research and clinical trials. Increased recognition of the relevance of multidisciplinary teams for skull base pathologies will encourage centers devoted to treating these patients to invest time, efforts, and resources in optimizing their collaboration, as this may be also critical in expertise recognition, resource allocation, and value-based competition.

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