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Secondary Expert Medical Opinions Associated with Treatment Strategy Changes and Substantial Cost Savings for Healthcare Payers

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SUMMARY

Goal: Consultations via commercial telemedicine platforms have enabled patients to access a larger network of providers whose secondary treatment recommendations may differ from those obtained by primary care providers. Subsequent changes in treatment recommendations may have meaningful implications for cost value and quality of care. However, despite the increased use of telemedicine, the frequency and type of treatment changes that occur are not well understood. This study evaluates the association between digital expert medical opinions (EMOs), treatment strategy changes, and cost implications, using data derived from a specialized musculoskeletal telemedicine platform.

Methods: Musculoskeletal EMOs from a large commercial digital health organization were retrospectively reviewed between 2020 and 2024. Treatment metrics, including surgical diversion (i.e., declining a surgical procedure), as well as the frequency of diagnosis and treatment plan changes, were calculated using existing client records and reports. Subsequently, an economic analysis was done to extrapolate potential cost savings based on treatment changes. Projections were constructed using average consultation cost savings based on Current Procedural Terminology (CPT) billing data

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and annual capture rates for a real-world enterprise client. Projections were also extrapolated to clients of various carrier sizes.

Principal Findings: Among the 544 musculoskeletal EMOs reviewed, 40.1% of consultations resulted in surgical diversion. More than half (53.0%) of treatment plans changed as a result of obtaining EMOs, while the diagnosis change rate was 22.5%. An average cost savings of $8,146.89 per EMO was estimated based on data from a current enterprise client. Extrapolation of this analysis to a medium-sized carrier (10,000 annual claims) and a large-sized carrier (30,000 annual claims) based on data from this enterprise client was estimated to be $754,558.44 and $2,263,675.33, respectively.

Practical Applications: Among secondary digital EMOs obtained through a telemedicine platform, more than half of treatment strategies were changed, with surgical diversion observed for 40% of patient cases. Resultant treatment and diagnosis strategy changes may result in increased value for patients, payers, and participating healthcare entities as demonstrated through the economic projections established using real-world data. Further extrapolation of savings based on claim volume, capture rate, and various client sizes may provide additional insights into the utility of telemedicine in other spaces as it pertains to defining appropriate treatment pathways and adjusting optimized costs.

INTRODUCTION

Telehealth represents a digital extension of healthcare, enabling virtual medical evaluations and treatment recommendations from experts (Jalali et al., 2021; Tanaka et al., 2020). Both asynchronous and synchronous digital consultations and healthcare resources may increase access to medical care and result in increased value and quality of care (Bauer, 2018; Davey et al., 2020; Stephens & Greenberg, 2022). Furthermore, commercial telehealth platforms may increase patient access to specialized experts who are otherwise geographically and financially inaccessible (Tanaka et al., 2020). Therefore, beyond direct access to care, it is critical to understand how treatment from experts with domain expertise may influence a patient's overall health trajectory and treatment plan.

Changes in treatment strategy are important as they may have implications for employer and payer costs, patient mental and physical health, and the value of care rendered (Bernacki & Tao, 2008; Leung et al., 2019). Telemedicine is uniquely positioned, as it has demonstrated, to serve as a feasible and sustainable method of access to medical specialists for patients who want to obtain second opinions (Behmanesh et al., 2020; Curfman et al., 2022; Shigekawa et al., 2018). Although the recommendations obtained from second opinions may differ from those obtained initially from primary care providers (Burger et al., 2020; Fahey et al., 2022; Meyer et al., 2015), the frequency and types of diagnoses and treatment strategy changes as a function of expert medical opinions (EMOs) obtained through specialty telemedicine platforms, particularly concerning orthopedics, remain

misunderstood. A better understanding of these metrics is important, as treatment-related changes may be associated with large cost fluctuations in episodes of care and may promote routine evaluation through prespecified care pathways and prompt policy changes among employers and payers (Bernacki, 2004).

This study addresses the paucity of data concerning the effect of EMOs on episode of care treatment pathways by systematically examining how EMOs conducted through a telemedicine platform influence diagnosis accuracy, treatment decisions, and associated cost implications in musculoskeletal care. This study examines the association between digital EMOs, treatment strategy changes, and cost implications. The authors hypothesized that EMOs obtained through a commercial telemedicine platform would be associated with changes in treatment strategies, including surgical diversion (i.e., declining a surgical procedure), in the majority of consultations. Furthermore, changes in treatment strategies would result in overall annual cost savings among enterprise clients.

METHODS

Study Design and Setting

This case study was performed using prospectively maintained internal databases derived from Best In Class MD (BICMD) telehealth platform company during a four-year period between 2020 and 2024. BICMD provides an integrated digital platform to facilitate expert and second medical opinions. EMOs are defined by medical second opinions conducted by subspecialists within BICMD's network of medical experts. These experts were selectively invited to BICMD based on specialized medical training at highly regarded institutions for their given specialty, clinical experience, and research productivity as a proxy for engagement with and use of evidence-based medicine in practice, as defined by their individual *H*-index score (an author-level metric that measures both the productivity and citation impact of experts' publications). An institutional review board exemption was permitted for this study because no protected health information or identifiable patient data were utilized. Criteria for study inclusion consisted of case data with an orthopedic categorization and cases that had closed before August 1, 2024. After the exclusion of nonorthopedic cases and orthopedic direct-to-consumer cases (n = 256), a total of 544 EMOs were eligible for inclusion in the final analysis. The BICMD enterprise clientele includes insurance carriers, self-insured employers, and third-party administrators.

Outcome Selection

The following variables were collected for each case: (1) orthopedic subspecialty, (2) primary provider's diagnosis and treatment plan (derived from client-provided medical records), (3) BICMD experts' informational diagnosis and treatment recommendations, and (4) projected cost savings. Each variable was collected and verified by a small team of virtual care facilitators at BICMD, using the information presented in each EMO. Based on the above variables, the following metrics were also defined: (1) surgical diversion rate, defined as a recommendation against surgery that the primary provider initially recommended; (2) treatment plan change rate, defined as any change in treatment recommendations from the primary

provider to the BICMD expert; and (3) diagnosis change rate, defined as any change in diagnosis from the primary provider to the BICMD expert. Treatment plan and diagnosis change rates were calculated from the total number of orthopedic EMOs, whereas surgical diversion was calculated only from the pool of EMOs for which the primary provider had recommended surgery as the treatment plan.

Cost-Savings Analysis

The cost-savings analysis considered two metrics: per-case cost savings and single-enterprise cost savings. Data for projected per-case cost savings were obtained from the BICMD database and assigned Current Procedural Terminology (CPT) codes, defined as medical codes that identify a given medical procedure or service used for billing and claims processing. Cost estimations were calculated based on the difference between the CPT codes designated for the BICMD experts' treatment recommendations compared to codes designated for the primary provider's treatment recommendations. Cost estimations for each CPT code were sourced from Find-A-Code, a subscription-based online database of medical billing codes and information (InnoviHealth Systems, Inc., 2024). Cost-saving estimates only accounted for procedural billing codes (such as CPT codes) and did not include any other costs, such as limited case management or legal fees, indemnity benefits, or hiring replacement workers.

The estimated cost savings for a single enterprise client was calculated from the total number of EMOs completed during the study period. This single client's data were then used to project cost savings based on client size and annual claims volume. Utilization assumptions for payer partners were based on an industry standard 5.0% capture rate for EMO-type services, such as those offered through BICMD. Cost savings were then derived based on the payer's annual case volume multiplied by the expected utilization, as determined by the capture rate (annual case volume = payer volume × 0.05). Annual cost savings were then calculated based on the cost savings per EMO multiplied by the annual case volume.

Statistical Analyses

All statistical analyses were performed with Microsoft Excel with R (Version 4.4.1), a statistical programming language, and RStudio (Version 2024.04.2+764). Descriptive statistics were utilized to quantify summary data as means with standard deviations or frequencies with percentages where appropriate. Statistical significance was defined as $p < .05$ in all circumstances.

RESULTS

EMO Characteristics and Diversion Rates

Among all musculoskeletal EMOs ($N = 544$), the majority of cases ($n = 219$; 40%) were sports medicine-related musculoskeletal conditions (see Table 1). Sports medicine and spine subspecialties represented approximately two-thirds of all cases that were evaluated with EMOs. Likewise, 74 of 185 eligible cases (among all consultations, 185 cases were recommended to proceed with surgery after initial outside consultation) resulted in surgical diversion after being further evaluated through a BICMD EMO, who instead recommended nonoperative management. Overall, recommendations from BICMD EMOs resulted in a surgical diversion rate of 40.1%, a treatment plan change

TABLE 1

Total Case Breakdown and Diversion Rates by Orthopedic Subspecialty

Subspecialty	Number (%) of Cases
Total expert medical opinions	544
Sports medicine (shoulder and knee)	219 (40)
Spine surgery (neck and back)	136 (25)
Hand, wrist, and elbow	66 (12)
Physical medicine and rehabilitation	42 (8)
Hip and knee replacement	38 (7)
Foot and ankle	34 (6)
Fracture treatment	5 (1)
Orthopedic oncology	4 (1)
Surgical diversion expert medical opinions	74
Sports medicine (shoulder and knee)	32 (43)
Spine surgery (neck and back)	22 (30)
Hand, wrist, and elbow	7 (9)
Hip and knee replacement	5 (7)
Foot and ankle	4 (5)
Physical medicine and rehabilitation	4 (5)

rate of 53.0%, and a diagnosis change rate of 22.5%. The subspecialty representations of all the surgical diversion cases ($N = 74$) are shown in Table 1.

Case Study: Projected Savings for Enterprise Clients Based on EMO-Driven Care Changes and Surgical Diversion

A subset of cases was identified from a single enterprise client (an insurance carrier, blinded for privacy considerations) of BICMD. The total number of orthopedic EMOs conducted for this client over the 2020–2024 period was 209, representing 22.6% of all orthopedic EMOs conducted at BICMD. The outcomes of the 209 orthopedic EMOs for this client were a surgical diversion rate of 14.4%, a treatment plan change rate of 29.2%, and a diagnosis change rate of 18.2%. Subsequently, an average cost savings of $8,146.89 was estimated per case. For cases resulting in surgical diversion, an estimated cost savings of $28,715.39 was extrapolated. The estimated total annual cost savings for this client was projected to be $301,823.66.

Generalizable projections were subsequently estimated based on the quantified cost savings for this representative enterprise client. Using the established annual claim volume of 4,000 claims and the 5% predicted EMO capture rate for BICMD, projections for a client with 30,000 annual claims (i.e., a large-sized insurance carrier) resulted in an estimated cost savings of $2,263,675.33 (see Table 2).

DISCUSSION

This study found that (1) among patients seeking second opinions on a diagnosis and treatment of a musculoskeletal condition using a commercial telehealth platform, the rate of treatment change was 53.0%, while the rate of diagnosis change was 22.5%; (2) among patients who were instructed that surgical intervention was necessary at their primary consultation, a surgical diversion rate of 40.1% was observed after second opinion consultation via the telehealth platform; and (3) when utilizing a subset of cases from a single insurance partner, an association between changes in treatment

TABLE 2

Projected Cost Savings Based on Enterprise Size

Number of Annual Claims (Carrier Size)	Cost Savings ($)
1,000 (small)	75,455.84
2,500	188,639.61
5,000	377,279.22
7,500	565,918.83
10,000 (medium)	754,558.44
15,000	1,131,837.67
20,000	1,509,116.89
30,000 (large)	2,263,675.33

per case and annual cost projections was established, suggesting that effective and resourceful treatment decisions made by experts may result in economically advantageous savings.

The second opinions provided by domain experts consulting for the large commercial telehealth platform (BICMD) in this study resulted in a treatment change for more than half of patients, while diagnoses were changed for 1 out of every 5 patients. These data suggest that expert consultation is important for correcting or refining medical decisions for patients with musculoskeletal conditions made by primary providers—which has implications for the patient experience and health outcomes. Indeed, a previous study suggested that second opinions are often associated with high rates of change in diagnosis and treatment, ranging from 10% to 62% (Payne et al., 2014). The association observed in this study is plausible, as domain experts may possess more advanced knowledge or experience concerning a specific range of medical conditions. Furthermore, performing consultations over a telehealth platform may allow for a greater time allotment for review and critical analysis of patient cases and prior documentation.

Approximately 40% of patients who were initially instructed that their condition would require surgical intervention were able to avoid this recommendation after obtaining a second opinion from a musculoskeletal expert, suggesting that utilization of digital EMOs may represent a strategic approach for avoiding overutilization of resources and inappropriate surgical treatment pathways. Previous literature within the musculoskeletal health domain, as well as within other medical disciplines, has also demonstrated that inappropriate surgical recommendations are frequently encountered during second opinions (Lohman et al., 2021; Luchey et al., 2016; Weigl et al., 2021). Epstein (2013) reported that among 183 consecutive patients with cervical or lumbar spine conditions who were told in a primary provider consultation that they required spine surgery, 60.7% of these surgical recommendations were deemed unnecessary after obtaining a second opinion evaluation, while only 6% were appropriate. This study found that spine surgery accounted for 25.0% of all enterprise orthopedic consultations conducted through BICMD, while 29.7% of all surgical diversions within the orthopedic category were recommended by spine surgery experts. A similar trend was observed regarding knee surgery, which accounted for 21.3% of all enterprise orthopedic consultations conducted at BICMD, with 25.7% of all surgical diversion cases being recommended by knee surgery experts. These findings are in accordance with the treatment changes observed in this

study, where a high rate of treatment and surgical diversion was observed for common elective procedure categories.

Outside of musculoskeletal health, second opinions have conferred substantial impacts on common elective procedure categories and healthcare outcomes. A systematic review of patient-initiated second opinions concluded that 34% of elective surgical indications were deemed unnecessary after further review (Payne et al., 2014), while a recent review of 29 studies reported that implementation of clinical practice guidelines, combined with mandatory second opinions for cesarean section indications, slightly reduced the risk of unnecessary cesarean sections (Chen et al., 2018).

Medical second opinions have also shown considerable impacts on clinically relevant treatment strategy changes among specialized radiologists and pathologists (Payne et al., 2014; Weinfurtner et al., 2019). These findings highlight the broader implications of expert second opinions in medicine, underscoring the potential for significant diagnostic, treatment, and procedural revisions beyond musculoskeletal health. However, as with any patient engagement medium, it is important to consider access and the propagation of healthcare disparities. Indeed, differences in access and related socioeconomic barriers that limit the ability of a patient to participate in virtual health consultations could bias data from such studies in which certain populations are underrepresented. On a larger health population scale, this differential access may contribute to disparate outcomes for sex- or race-specific outcome gaps and may further widen them; therefore, future research is required in order to determine whether digital EMOs are socially equitable and accessible.

Major musculoskeletal procedures, such as lower extremity arthroplasty or spine surgery, present inherent risk, including treatment-related complications, readmissions, and revision surgeries, which may affect one fourth to one half of patients in select populations (Houdek et al., 2017; Inoue et al., 2020; Sizer et al., 2022). Therefore, inappropriately indicated surgeries may result in greater risk than simply documented misjudgment. Indeed, improvement in medical decision-making through second opinions is a targetable intervention point within episodes of care that can help avoid such adverse events that may lead to considerable health-related and financial burdens (Lange et al., 2022). Existing literature has consistently observed a substantial incidence of differing recommendations for surgery among face-to-face encounters (Lohman et al., 2021; Luchey et al., 2016; Weigl et al., 2021). In contrast, the current study suggests that utilization of a specialized telehealth platform for musculoskeletal specialty care is feasible and may represent a convenient expert face-to-face alternative with similar effectiveness. Through a telehealth alternative, patients may be placed on appropriate treatment pathways and potentially avoid unnecessary or inappropriately indicated interventions. Indeed, the utilization of specialty EMOs may play a critical role in promoting evidence-based treatment decisions, while optimizing the value of care for patients. However, it is important to consider the decision-making biases that are present in EMOs among all patient encounters, whether face-to-face or over a virtual medium. Cognitive biases on

decision-making have been reported in the orthopedic literature in a series of hypothetical patient vignettes and have been further discussed among all surgical fields (Armstrong et al., 2023; Janssen et al., 2021). Cognitive biases, provider preferences, and patient factors are variables that could be considered further when determining treatment strategy among EMOs. Future large-scale studies are warranted to confirm the initial observations presented in this study.

Antonioli and colleagues (2023) performed an economic analysis of a second opinion program on spine surgeries and reported that of the 1,088 participants, conservative management was recommended for 662 (60.8%) patients, 49 (4.5%) were recommended for injection, and 377 (34.7%) for surgery. Furthermore, their program resulted in savings of $6,705 per patient associated with an appropriate treatment indication, while for patients achieving a minimally important change in quality of life compared to their first referral, an incremental cost-effectiveness ratio of $87,066 (a range of $41,832–$273,016) per additional patient achieving a minimally important change was realized.

As the economic analysis in this study was based on CPT billing data alone, it is important to note that it did not consider other direct medical costs or indirect costs—such as indemnity claims, lost time from work, replacement hires, attorney fees, and involvement—that often accompany enterprise claims that may ultimately result in greater overall costs (Bernacki, 2004; Bernacki & Tao, 2008; Leung et al., 2019; Pieretti et al., 2022). Therefore, the projected financial savings is likely an underestimate of the true overall economic impact experienced as a result of EMOs communicated via telehealth. Regardless, this suggests that beyond treatment changes that have potentially important mental and physical health repercussions for patients, appropriate treatment recommendations made through digital musculoskeletal EMOs have substantial financial implications for payers. This is particularly relevant, as overprovisioned musculoskeletal care in the United States is a major driver of high healthcare costs for employers, insurers, and payers (Cvetanovich et al., 2019; Dunning et al., 2010; Russo et al., 2021).

Study Limitations

Several limitations should be considered in the context of the current data. First, cases with missing primary diagnoses and treatment plan data were unable to be used in order to contribute to the numerator of the health-related metrics included in this study. Second, the use of CPT code data to estimate cost savings and the generalizability to other enterprise clients may result in different estimates of cost when compared with true observed savings data. For example, BICMD's utilization of Find-A-Code includes CPT billing prices based on national averages rather than state differences in billing. In many cases, CPT codes were associated with BICMD's orthopedic clinician rather than directly from the primary provider. Third, this study assumes that EMOs represent the gold standard of treatment when compared to primary provider opinions, thereby assuming surgical diversion and treatment or diagnosis changes are correct. In addition to evidence-based practice and decision-making, it is important to consider how cognitive biases, provider preferences, and

patient factors further impact treatment strategies. Future studies could address the impact of EMOs on patient outcomes and satisfaction with the collection of follow-up data. Finally, a small number of cases were evaluated from a single surgical specialty on one telehealth platform, and it is unknown where these associations translate to other medical disciplines, despite well-known overutilization of elective procedures in medicine.

CONCLUSION

Among secondary digital EMOs obtained through a single telemedicine platform, more than half of treatment strategies were changed, with surgical diversion observed for approximately 40% of patients. Despite current limitations, such as the use of CPT data, a lack of patient-reported outcome measures, and a focus on a single surgical subspeciality, resultant treatment and diagnosis strategy changes may result in increased value of care rendered, as demonstrated for economic projections of current enterprise clients and the further extrapolation of savings based on claim volume and capture rate. Frequent treatment strategy changes could apply to a broader collection of medical conditions and specialties that may be affected by misutilization or overutilization of elective procedures and treatments, which are highly prevalent in musculoskeletal health cases.

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