Editorial

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The economic cost of racial disparities in perioperative care

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"In order for healthcare providers and executives to better recognize the financial burden produced by racial disparities in care, it becomes vital to produce actionable data that attaches a cost to a specific, solvable disparity"

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Following the Institute of Medicine's 2002 report, 'Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care', there has been an increase in efforts to understand and counteract the social determinants that lead to worse outcomes in minority populations' care. Such inequities may produce excess financial burden to health systems and society-at-large through both direct and indirect negative externalities. LaVist *et al.* calculated that between the years of 2003 and 2006, medical expenditures secondary to racial inequality totaled US$229.4 billion, roughly translating to 0.3% of the US annual GDP and 2% of all healthcare spending [1]. The indirect cost of lost productivity resulting from these disparities during that same time period was calculated to be approximately US$1 trillion [1]. Nanney *et al.*'s economic analysis of Minnesota's disparity expenditures highlights that lost productivity time due to medical illness costs the state approximately US$427 million a year [2]. These macro-modeling studies suggest that solving disparities in care delivery models would improve the value of healthcare and efficiency in workplaces.

Understanding these costs at the hospital-level across care systems has been difficult due to a lack of transparency and consistency in service pricing [1]. There has been extensive progress made in quantifying racial disparities specifically in the perioperative space and the role played by anesthesiologists [3,4]. Perioperative care continues to serve as the benchmark for financial health at the systems level, with some studies suggesting that elective surgery generates greater than 40% of a hospital's revenue stream [5]. In order for healthcare providers and executives to better recognize the financial burden produced by racial disparities in care, it becomes vital to produce actionable data that attaches a cost to a specific, solvable disparity. Here we lay a foundation for such future work by providing 'back of the envelope' estimates of additional secondary to racial/ethnic and socioeconomic disparities in perioperative care, namely: postoperative nausea and vomiting (PONV), blood transfusions and postoperative pain.

PONV

PONV serves as a quality measure in perioperative care with widely accepted prophylactic and treatment guidelines with measurable risk factors and outcomes [3]. PONV has been linked to longer post-anesthesia care unit stays, poor patient experience and increased costs in ambulatory surgery. Reduced antiemetic prophylaxis administration has been shown when comparing socioeconomic markers: Medicaid versus commercially insured and lower versus higher median income patients. Specifically for race, there is 15% reduced antiemetic prophylaxis administration for black versus non-black patients [3].

To surmise an overall cost to this disparity, we look at a number of studies which estimate an added cost between US$415 to 1055 (primarily due to delays to discharge, increased nursing labor units and lost revenue vs direct material care costs) per patient with PONV within the ambulatory surgery setting [6,7,8]. These estimates do not take into account the direct cost to patients from lost wages and longer absences from work, which may also disproportionately affect black patients more than white patients. Here we suggest that, in general terms, by

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combining the disparity rate of PONV (15%) and the cost of PONV (conservatively US$760, which is both a close median in the range stated above and correlates with the estimate by Parra-Sanchez's time-motion economic analysis [7]), our estimated preventable cost is US$114 (US$760 × 0.15) per surgical case with a black patient. Given the incidence of PONV estimated at 30% and the annual cost to surgical centers estimated to be in the billions, we hypothesize that preventable PONV from racial disparities stand as a major cost driver to surgical centers [8].

Blood transfusions

Variation in blood transfusion utilization during major surgery has been shown to occur based on patient race, even when accounting for patient demographics, comorbidities, surgical case and geography [9]. Qian *et al.* show that black patients were more likely than white patients to receive red blood cell transfusion for coronary artery bypass surgery (CABG) (41%), total hip replacement (THR) (39%) and colectomy (8%) after controlling for all aforementioned factors. When comparing black patients with private insurance to similar white counterparts, black patients had a 62% higher likelihood of transfusion for CABG and a higher likelihood 27% for THR [9]. Excessive transfusion has been linked to poorer patient-centered outcomes, specifically a higher likelihood of transfusion reaction, longer hospital stays and increased morbidity and mortality [9].

Costs associated with excess transfusion are comprised of both direct costs related to the supply of the product as well as indirect costs that come from resultant care provided. Based on activity-based cost analysis by Shander *et al.*, the direct and indirect costs contributed between US$522 and US$1183 (mean US$761) per RBC transfusion, approximately 4× higher than the actual product acquisition cost [10]. Thus, we estimate the excess cost of this disparity per excess transfusion to be US$312 per CABG (US$761 × 0.41), US$297 per THR (US$761 × 0.39) and US$61 per colectomy (US$761 × 0.08). For these three procedures alone, there may be an exorbitant price paid by hospital systems secondary to variable and unnecessary transfusion practices.

Regional anesthesia versus general anesthesia

The clinically appropriate use of regional anesthesia in conjunction with or as a substitute for general anesthesia has been shown to improved perioperative outcomes, including length of stay, infection rates, morbidity and mortality [11,12]. The limited studies looking at utilization of regional versus general anesthesia have shown disparity in utilization based on race and socioeconomic class, with health literacy and language barriers potentially driving under-utilization. Tighe *et al.* showed that the primary method of payment was associated with the likelihood of perioperative use of peripheral nerve block placement for ambulatory orthopedic surgery [13]. Memtsoudis *et al.* found that black and other minority inguinal hernia repair patients were 74% less likely to receive epidural anesthesia and 176% more likely to receive general anesthesia when compared with white patients; similarly, Memtsoudis *et al.* found that neuraxial anesthesia and peripheral nerve block were 12% less likely to be used in black and Hispanic patients for lower extremity orthopedic procedures as compared with white patients [14,15]. Future investigation is needed to quantify this disparity in perioperative care across a broader subset of surgical procedures. However, these highlighted disparities in anesthesia type provided cannot be categorically delineated from healthcare system policies, individual surgeon or anesthesiologist practice patterns and patient preferences and comorbidities [16].

The use of regional anesthesia as an alternative to general anesthesia has been associated with lowering costs due to superior perioperative outcomes, faster recovery times and a lower incidence of PONV and post-operative pain [17,18]. Multiple studies have examined the cost savings of spinal anesthesia in lower extremity surgery compared against general anesthesia to range between US$300 and US$2900 per case depending on savings from faster recovery times, avoidance of overnight stay and decreased anesthetic material and production costs [17,18,19,20]. It is reasonable to hypothesize that similar cost savings exist across a larger subset of surgeries where regional anesthesia could be utilized over general.

Conclusion

Here we present our hypothesis that racial/ethnic and socioeconomic disparities in perioperative care are a major driver of financial cost to hospital systems. Our calculations are based on assumptions of uniform costs and disparities across systems; the specific cost to a health system will vary based on a myriad of factors not accounted for in our analysis but is applicable to any diverse healthcare system. Currently there is very limited understanding of the actual costs of racial disparities in care; thus, our cost estimations may help define the scope of future studies. This work, which looks to quantify specific racial disparity costs in the perioperative space, can help bridge the gap

between macroeconomic modeling and nonracial specific cost data. We hope this discussion helps to highlight the hidden financial burden created by inequality and injustice within our clinical practice and healthcare systems to better galvanize action on the part of providers and administrators.

Author contributions

R Jotwani conducted the literature review and writing of the manuscript. Z Turnbull conducted the literature review and editing of the manuscript. R White conducted the literature review and editing of the manuscript.

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