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Editor's Spotlight/Take 5

Editor's Spotlight/Take 5: Future Patient Demand for Shoulder Arthroplasty by Younger Patients: National Projections

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People love predictions. Whether we are handicapping presidential elections or ballgames, it is always fun to compare our guesses to those of pundits and peers. This year's meeting of the American Academy of Orthopaedic Surgeons was in Las Vegas, NV, USA; I have to imagine that at least a few readers of this journal left some money in the Vegas sand because of imperfect predictions at dice, cards, or the roulette wheel. If they did not, someone else sure did. Nevada's nonrestricted gaming licensees reported a total "gaming win" of USD 950,692,054 last December [4]. That is nearly USD 1 billion changing hands because of predictions—in one month, in one city, for entertainment purposes alone.

People need predictions. Budgets of countries, orthopaedic departments, and households depend on them. Businesses thrive or fail based on their ability to anticipate the future. Microsoft's then-CEO Steve Ballmer opined in 2007 "There's no chance that the iPhone is going to get any significant market share. No chance" [3]. While the sales of this device appear to be leveling off, that level involved the sale of an average of 34,000 units per hour, every hour, for the last fiscal quarter. That is enough iPhones—more than 73 million in just 3 months [1]—to narcotize one in every 100 human beings on Earth with Internet cat videos. And Mr. Ballmer no longer works at Microsoft.

Against that backdrop, who would not be interested in methodologically sound prognostications about the anticipated demand for a common surgical procedure? This month, Surena Namdari's group at the Rothman Institute in Philadelphia, PA, USA provides those predictions. His team of clinicians and methodologists developed a robust model describing the future of shoulder arthroplasty. They found usage of this procedure in patients younger than 55 years of age is increasing by a brisk 8% per year, and they anticipate the demand in patients older than 55 years of age will increase by an extraordinary 755% between 2011 and 2030. Total shoulder arthroplasty volumes are rising much faster than those of hemiarthroplasty; the former will account for more than three quarters of the index arthroplasties in the next 15 years, should these predictions hold true.

But if the CEO of the leading technology firm could be that far off about

Note from the Editor-In-Chief: In "Editor's Spotlight," *one of our editors provides brief commentary on a paper we believe is especially important and worthy of general interest. Following the explanation of our choice, we present* "Take Five," *in which the editor goes behind the discovery with a one-on-one interview with an author of the article featured in* "Editor's Spotlight."

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one competitor's cellphone—and aspiring card sharks can lose enough money in Las Vegas in 1 year [4] to cover the gross domestic product of Liechtenstein for 3—it seems reasonable to approach two-decade medical predictions with some skepticism. Healthcare systems, medical therapies, surgical innovations, and innumerable other changes can influence procedure volumes in ways we cannot now know. Demographics of regions and nations can shift, and markets can saturate. Even so, these sorts of predictions cause us to think about public policy, workforce decisions, and training needs in ways that make it more likely we will be prepared for what may be coming.

Perhaps most importantly, the implications of studies like this one reach far beyond the populations in which they are performed. This study is of interest regardless of whether or not you perform shoulder arthroplasty, since the principles that guided the analysis apply broadly across our specialty, and the market forces, demographic trends, and political realities driving the observed trends likely will influence other orthopaedic subspecialities in similar ways. Join me as for a look at the future with Surena Namdari, MD, MSc, senior author of "Future Patient Demand for Shoulder Arthroplasty by Younger Patients: National Projections" in the Take-5 interview that follows.

Take Five Interview with Surena Namdari MD, MSc, senior author of "Future Patient Demand for Shoulder Arthroplasty by Younger Patients: National Projections"

Seth S. Leopold MD: *Congratulations on this fascinating and important work. Others have performed prediction studies to estimate demand for lower-extremity arthroplasty as well as to anticipate bigger-picture needs like specialty versus primary-care needs for medicine more broadly. As you know, not all of the predictions made in these studies have come to pass. What problems did you observe in prior studies that helped you to refine and improve your methodology relative to those earlier efforts?*

Surena Namdari MD, MSc: As you have pointed out, a projection is an educated guess. We attempt to determine population and utilization trends during a historic period of time and combine this information with census growth projections in order to project shoulder arthroplasty utilization rates. With regard to the inaccuracy of projections, numerous variables can account for this. Interestingly, some of the variables that one might consider to be important for altering projections have not been shown to be so. For example, one would likely argue that the economic downturns in the 2000s would have substantially influenced national growth trends for hip and knee arthroplasty. If a projection model created in the 1990s had accounted for this, it would likely have underestimated the utilization rate. Kurtz et al. [2] showed that economic downturns in the 2000s did not substantially influence the national growth trends for hip and knee arthroplasty in the United States. Similar to any multivariate regression model that aims to determine predictors of an outcome, the model used is only as good as the number and quality of variables entered. Because of this, projections should not be considered

Surena Namdari, MD, MSc

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rigidly. Like stock projections, they should be reassessed and modified based on changing utilization trends, health care expenditures, and population characteristics. To me, the real question is: How often should projections be reassessed and modified?

Dr. Leopold: *What about the factors that are not so easy to control methodologically—unforeseeable shifts in surgeon incentives (like reimbursement), population demography, market saturation, and medical or surgical therapies that can reverse or prevent disease, among others. In light of those kinds of issues, how should a reader evaluate studies like yours?*

Dr. Namdari: This is an excellent point. This type of study functions under the assumption that the trends experienced during the past 10 years will be the same trends that will be observed during the next 15 years. It is possible that a disruptive innovation such as an arthritis-prevention pill or healthcare reforms that either increase or limit access to care could meaningfully affect the relationship between supply and demand for shoulder arthroplasty. However, these types of healthcare changes typically occur gradually and may be unlikely to change the trajectory of our projections during the next 15 to 20 years. Despite this, it is important to understand that the actual numbers (the percentage growth or decline) are likely less important (and accurate) than the overall trend. While the overall utilization of shoulder arthroplasty in young patients may not reach 300% of that seen in 2011 by 2030, I do believe that we will see a substantial increase and will see comparatively greater increases in older patients.

Dr. Leopold: *Which of your results did you find most surprising and why?*

Dr. Namdari: Based on the work done by Kurtz et al. [2] that projected greater increases in hip and knee arthroplasty in younger patients compared to older patients, we expected to see a similar trend in shoulder arthroplasty. While the rate of shoulder arthroplasty in young patients is increasing significantly, the rate is increasing twice as fast in older patients. We believe that this difference is largely explained by the expanding indications of the reverse arthroplasty that now provides a reliable solution for shoulder problems that were previously unsolvable. Additionally, the relative decrease in the proportion of hemiarthroplasties in both younger and older patients may be explained by the increasing number of shoulder and elbow fellowship positions in recent years. As a result, there have been a greater number of recent graduates who understand the benefits of total shoulder arthroplasty and are better trained to perform glenoid resurfacing.

Dr. Leopold: *If you could put your study in front of any public officials or economic decision-makers, who would they be, and how would you like them to use your predictions?*

Dr. Namdari: This, too, is an excellent question. When policymakers and those working to reform our healthcare system consider the needs for specialized orthopaedic care, such as shoulder arthroplasty, these predictions underscore a potential problem with access to care for our patients. With already rising healthcare expenditures, will the healthcare system be able to finance an additional 163 shoulder arthroplasties per 100,000 people by 2030? Will there exist the necessary number of trained surgeons to carry out these procedures? Finally, with the increasing number of primary arthroplasties performed, will the resources exist to tackle the substantial revision burden that is not currently quantified? In order to meet this potential set of needs pertaining to specialized services, policymakers, insurance companies, healthcare systems, implant manufacturers, and physicians must identify creative ways to promote the delivery of high-quality, efficient, low-cost, and long-lasting care.

Dr. Leopold: *If your predictions come true, there may simply not be enough individuals skillful in performing total shoulder arthroplasty to meet the anticipated need. Speak in the specific case and then for studies like this more*

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generally if you can: How should information like yours be used to guide our approaches to orthopaedic postgraduate education and skills training beyond residency?

Dr. Namdari: As you know, the number of funded positions for residency training has not kept up with the demand for physicians in general and specialists in particular. The looming shortage of physicians is a real problem. However, I do not necessarily think that changing our approaches to education or creating more fellowship or residency slots to meet the projected demand is likely to be successful in isolation. Instead, I believe that we should focus on changing our delivery systems to deliver the most high-quality and efficient care possible. It has been well documented that high-volume, specialized centers can deliver care with lower complications and higher patient satisfaction. The solution to the rising burden of shoulder arthroplasty may not be merely to train additional surgeons who perform fewer than five to 10 arthroplasties a year, but rather to foster the development of highly efficient referral centers that can provide the health care system with low-cost, high-quality care that can translate into optimal and long-lasting results for patients.

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