



Identifying the *procedural gap* and improved methods for maintaining accuracy during total hip arthroplasty [☆]



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ARTICLE INFO

Article history:

Received 1 February 2016

Accepted 10 July 2016

ABSTRACT

Osteoarthritis is a ubiquitous condition, affecting 26 million Americans each year, with up to 17% of adults over age 75 suffering from one variation of arthritis. The hip is one of the most commonly affected joints and while there are conservative options for treatment, as symptoms progress, many patients eventually turn to surgery to manage their pain and dysfunction. Early surgical options such as osteotomy or arthroscopy are reserved for younger, more active patients with less severe disease and symptoms. Total hip arthroplasty offers a viable solution for patients with severe degenerative changes; however, post-surgical discrepancies in leg length, offset and component malposition are common and cause significant complications. Such discrepancies are associated with consequences such as low back pain, neurological deficits, instability and overall patient dissatisfaction. Current methods for managing leg length and offset during hip arthroplasty are either inaccurate and susceptible to error or are cumbersome, expensive and lengthen surgical time. There is currently no viable option that provides accurate, real-time data to surgeons regarding leg length, offset and cup position in a cost-effective manner. As such, we hypothesize that a *procedural gap* exists in hip arthroplasty, a gap into which fall a large majority of arthroplasty patients who are at increased risk of complications following surgery. These complications and associated treatments place significant stress on the healthcare system. The costs associated with addressing leg length and offset discrepancies can be minor, requiring only heel lifts and short-term rehabilitation, but can also be substantial, with revision hip arthroplasty costs of up to \$54,000 per procedure. The need for a cost-effective, simple to use and unobtrusive technology to address this procedural gap in hip arthroplasty and improve patient outcomes is of increasing importance. Given the aging of the population, the projected increases in the volume of procedures over the coming decades and the economic pressures associated with downward pricing pressure and bundled payments, the need to address this gap is underscored.

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Background

Osteoarthritis (OA) is a common and potentially debilitating condition affecting up to 26 million patients each year in the United States alone [1]. Worldwide, the prevalence of arthritis varies from below 3% in Asia and Africa to 7.2% in the United States and 10.1% in Europe [1]. The hip is commonly affected by OA, with 5.9% of adults aged 45–54 and up to 17% of adults aged 75 or older currently suffering from hip OA symptoms [2]. The population of older patients living with disabling conditions is expected to

increase exponentially over the next generation, due to improved treatment of chronic diseases. The resulting number of patients with OA is projected to double from 21.4 million in 2005 to 41.1 million by 2030, when the need for total hip arthroplasty (THA) will have growth by 174%, to 572,000 primary procedures per year in the US alone [3].

Hip OA significantly impacts patients by placing limitations on quality of life and functional ability, but also impacts the healthcare system as a whole, with hip replacement procedures accounting for \$13.7 billion in US healthcare expenditures in 2009 [4]. With the expected exponential growth in OA cases, and specifically that of the hip joint, the increased burden placed on the healthcare system for primary treatment of hip OA will continue to be substantial. Compounding these issues is the added strain associated with failed primary procedures that require revision.

[☆] No specific funding was used in the creation of this work.

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