Optimal Treatment Policies for Pelvic Organ Prolapse in Women

Pelvic organ prolapse (POP) is a common gynecological disorder impairing many women’s quality of life (QoL). Prolapse results from weakening of the muscles and ligaments supporting the pelvic organs. A POP patient suffers from symptoms such as constant pelvic pressures, low back pains, bleeding, incontinence and constipation. As a chronic disease, POP affects a large population of females in the world, especially senior women with childbirth experience. Studies have shown that approximately 40% of women in the U.S. have POP that requires medical intervention (Ellerkmann et al. 2001, Swift et al. 2005, Gutman et al. 2008). Overall, approximately 200,000 inpatient surgical procedures are performed every year in the U.S. to treat POP, incurring costs of over $1.5 billion (Jones et al. 2010). Moreover, with the increasing life expectancy worldwide, the impact of POP on quality of life has become even a bigger concern. The 2013 World Population Aging Report, released by the Department of Economic and Social Affairs of United Nations, indicates that the number of people above age 60 will increase rapidly and reach 21% of the entire population by the year 2050. This is expected to result in a 45% increase in the demand for POP treatment (Jones and Harmanli 2010).

A number of options has been developed and implemented in clinical practice when treating POP. These options can be classified into four categories: watchful waiting, conservative treatments, reconstructive surgery, and obliterative surgery. Watchful waiting involves no specific treatment action other than observing the progress of POP symptoms. Conservative treatments include non-surgical options for POP, such as the use of a pessary to support the pelvic organ, pelvic floor muscle exercises, weight-loss, and other treatment that aims to relieve POP related discomfort. Reconstructive and obliterative surgeries are both surgical options for POP, but the two approaches and subsequent consequences differ. Reconstructive surgeries restore pelvic organ’s anatomy and provide resuspension of vaginal vault. Reconstructive procedures typically have longer operating times and pose a higher risk of complications, but postoperative coital function is preserved. Obliterative surgeries, on the other hand, permanently close the vagina. In comparison to reconstructive surgeries, obliterative procedures require shorter
operating times and have a decreased risk of complications. Overall, obliteratorive surgeries have success rates near 100% (Fitzgerald et al. 2006), which is significantly higher than that of reconstructive surgeries, as it is estimated that 27% of reconstructive surgeries might require follow on operations (Harmanli 2009).

When discussing POP treatment options with patients, gynecologists must consider factors such as the patient’s age, expectations, health state, degree of bother, and desire to maintain coital function. Based on such factors, a patient with lower POP stages may prefer more conservative treatment options before considering a surgical intervention. For patients with higher stages of POP, a patient may be more amenable to some surgical intervention. On the other hand, there are no general guidelines that a physician can use to recommend a specific treatment option to a patient. Physicians make recommendations based on patient preferences and clinical experience without referring to a specific quantitative analysis based guideline.

Our objectives in this paper are to identify optimization-based treatment policies to serve as a reference for physicians, and also to assess the value of such optimization-based policies by comparing these with the current policies used in practice. More specifically, we utilize actual clinical and survey data and try to answer the following practical research questions:

1. Given the available data on treatment options and their effectiveness over time, what are optimization based treatment policies that maximize a POP patient’s expected future quality of life? 
2. How do the treatment decisions in these policies differ from those currently used by physicians? 
3. What value can potentially be generated through the use of optimal policies as decision aids by physicians? 
4. What is the cost impact of optimization based treatment policies when compared with the current practice?

Our study contributes both to the current state of research and clinical practice for POP by providing insights for treatment. Specifically, we use available clinical data and develop an MDP model to capture the dynamics of POP disease progression under different treatment options. The model is used to identify optimal treatment plans aimed at providing guidance for physicians as to which treatment option to use/recommend based on a patient’s age, QoL.
level, surgical history, and personal preferences. These results are then compared with the current practice as represented through survey data collected from practicing physicians.

As part of the major findings of our research, we draw the following general conclusions for the optimal POP treatment policies: (1) For younger patients up to age 50, watchful waiting is always recommended when the patient’s QoL level is above 7 based on a scale of 1 to 10 for QoL, with 10 being the healthiest case. This QoL threshold gradually decreases at a rate of around 1 level per 16 years as the patient gets older; (2) Surgical options are recommended for patients with QoL levels below 6; (3) The age threshold to prefer obliteratorive surgery over reconstructive surgery is 73; (4) Obliteratorive surgery should not be considered when the desire to preserve coital function corresponds to more than 40% of a patient’s quality of life.

Comparing these policies with the current practice, we quantitatively conclude that: (1) The proposed policies are expected to provide a QoL improvement of between 9%-18% over currently utilized physician policies; (2) The expected socio-economic value of optimization based policies can be around $8 billion considering the treatment seeking POP population in the U.S.; (3) Optimal policies imply an estimated savings of around $570 million in POP treatment costs while at the same time improving the QoL of patients.

References