Prostate cancer is one of the most prevalent malignancies diagnosed in North American men; it is the second-most common type of cancer in men in the United States and the most common type of cancer among men in Canada, with an estimated 186,320 (American Cancer Society, 2008) and 24,700 (Canadian Cancer Society, 2008) new cases being diagnosed in 2007, respectively. Typically, men diagnosed with localized prostate cancer have two options for potentially curative treatment: radiation therapy or radical prostatectomy (RP). Many men choose RP to remove the cancer; however, surgical intervention has two dreaded possible side effects: erectile dysfunction (ED) and urinary incontinence (UI) (Burt, Caelli, Moore, & Anderson, 2005).

Although UI can be a problem in patients who have undergone radiation therapy, the focus of this article is on UI in relation to RP, defined by the International Continence Society as the “complaint of involuntary leakage of urine” (Abrams et al., 2002, p. 168). UI affects at least 50% of patients after RP immediately following catheter removal (Rondorf-Klym & Colling, 2003; Smither, Guralnick, Davis, & See, 2007; Talcott et al., 1997). The occurrence of UI after RP has been reported to decrease over time. In a study conducted by Smither et al., more than 91% of the 203 subjects who received nerve sparring RP were classified as having no or minimal UI by the 54th week after surgery. Conversely, in a survey of 1,288 men, Penson et al. (2005) found that 35% of the subjects reported total urinary control and another 49% reported occasional urinary leakage by one year after RP. Despite the apparent decrease in incidence of UI over time, the occurrence of UI has a negative impact on quality of life (Moore & Gray, 2004; Moore & Jensen, 2000).

Although men who are scheduled to undergo RP receive information on treatment options and their side effects, such as ED and UI, the need for information remains high after surgery (Burt et al., 2005; Moore & Estey, 1999). Therefore, nursing interventions should focus on education, support, and advice; encouraging the development of self-care skills; and confirming progress (Maliski, Heilemann, & McCorckle, 2001).
The Human Response to Illness (HRI) Model provides a framework for understanding human responses to a specific condition or diagnosis in the physiologic, pathophysiologic, experiential, and behavioral domains of the illness experience (Carrieri-Kohlman, Lindsey, & West, 2003). The model is used as a framework in this article to provide a broad and in-depth understanding of the symptom of UI following RP and the basis for clinical interventions as well as evaluating outcomes (see Figure 1).

**Urinary Incontinence After Radical Prostatectomy**

After RP, UI will be explored from the physiologic, pathophysiologic, experiential, and behavioral perspectives of the HRI model. In addition, personal and environmental factors that influence this response will be discussed.

**Physiology of Micturition in Men**

The lower urinary tract is composed of the urinary bladder, which serves as a reservoir, and the bladder outlet, which serves as a sphincteric mechanism. The sphincteric mechanism can be divided further into the proximal and distal urethral sphincters; these act as valves that exert control on the flow of urine (Nitti, 2002) (see Figure 2).

The proximal urethral sphincter consists of the bladder neck, prostate, and prostatic urethra. These structures are innervated by the autonomic parasympathetic fibers that extend from the pelvic nerve (Blaivas & Groutz, 2002). The distal urethral sphincter consists of the rhabdosphincter (i.e., external sphincter), extrinsic paraurethral musculature, and connective tissue structures of the pelvis (Blaivas & Groutz). This sphincter extends from the apex of the prostate to the perineal membrane and is part of the pelvic floor (Heinzer, Hammerer, & Huland, 1999). It is made up of smooth and skeletal muscle that is innervated by the pudendal nerves, dorsal nerve bundles, and the autonomic nerves from the pelvic plexus (Peyromaure, Ravery, & Boccon-Gibod, 2002). This combination of musculature and nerves is controlled by the somatic and autonomic nervous systems.

During normal filling of the bladder, the detrusor muscle (i.e., bladder muscle wall) remains physically stable and does not contract, while the internal sphincter, which is located at the bladder neck, ensures closure of the urethra to prevent the passage of urine (Nitti, 2002). The accumulation of urine in the bladder leads to the distension of the bladder wall, which stimulates the sympathetic nerves of the sphincteric mechanism to keep the sphincter closed. The same sympathetic stimulation also inhibits the detrusor from contraction via spinal reflex pathways, promoting continence (Blaivas & Groutz, 2002).

Once the bladder fills, information from the stretch receptors in the bladder is carried via afferent pathways to the pontine micturition center (PMC). The signal activates the PMC, giving way for the parasympathetic nervous system to take over and provides the awareness of the need to void. When the person decides to void, signals from the PMC travel down the spine via efferent pathways, inhibiting the spinal reflex pathways that promote continence. This allows for the total relaxation of the sphincteric muscles followed by a sudden contraction of the detrusor muscle, and the consequent urination (Blaivas & Groutz, 2002).

**Pathophysiology of Urinary Incontinence After Radical Prostatectomy**

Pathogenesis of UI after RP occurs when the proximal sphincter is removed during surgery and normal function of micturition is impaired. Most men rely on their proximal sphincter for continence control (Joseph, 2001). However, with RP, the prostate, as well as the prostatic urethra

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**Figure 1. Modified Human Responses to Illness Model: Equation for the Assessment and Management of Urinary Incontinence After Radical Prostatectomy**

and often the bladder neck, are resected to remove all possible cancerous tissue. The bladder then is anastomosed directly to the distal urethral sphincter (Heinzer et al., 1999; Sakai, Harada, Hara, Eto, & Miyake, 2005) (see Figure 3). The three major pathologic causes of UI after RP are bladder dysfunction, sphincter weakness, and pelvic floor weakness.

**Bladder dysfunction:** Bladder dysfunction is a leading cause of UI after RP. The reasons for bladder dysfunction include bladder over-activity, impaired bladder compliance, or a combination of both (Blaivas & Groutz, 2002; Nitti, 2002; Porena, Mearini, Mearini, Vianello, & Giannantoni, 2007). Bladder over-activity causes urge incontinence when the detrusor wall is unstable and contracts involuntarily. Impaired bladder compliance refers to the premature contraction of the bladder, which combined with weak sphincteric control, causes stress incontinence.

Bladder dysfunction is believed to be a consequence of damage to the neural wiring of the bladder and damage or removal of the internal sphincter (at the bladder neck) during RP (Porena et al., 2007). In either case, detrusor pressure increases as the bladder fills, overcoming the resistance of the sphincteric mechanism, causing incontinence (Nitti, 2002). Fortunately, however, this usually is temporary, as urinary continence tends to improve over the first few years after RP (Namiki et al., 2006).

**Sphincter weakness:** Sphincter weakness results in the inability of the sphincter to resist an increased abdominal and/or bladder pressure and may cause symptoms of incontinence. In 1995, Chao and Mayo noted that, “incontinence after RP is more likely to be secondary to [distal] sphincter weakness in the majority of cases” (p. 17). Subsequently, several studies support the notion that sphincter insufficiency is the most salient reason for incontinence after RP (Groutz et al., 2000; Kielb & Clemens, 2005; Sekido, Hinotsu, Kawai, Shimatzui, & Akaza, 2006). Although an objective pad test is invasive (the bladder is filled via catheters to measure bladder muscle wall compliance and stability) it helps to discern whether incontinence is because of bladder dysfunction or sphincteric weakness.

Indirect ways of measuring incontinence include voiding diaries to measure the occurrence of incontinence (Jaffe, Ginsberg, Silverberg, & Harkaway, 2002) and questionnaires such as the Expanded Prostate Cancer Index Composite Urinary Assessment (EPIC UA), the Incontinence Impact Questionnaire (IIQ-7), and the Incontinence Severity Index (ISI). The EPIC UA is a 12-question subcomponent of a much larger

**Pelvic floor weakness:** The pelvic floor is a dome-shaped muscular sheet that contains the external sphincter. It is pre-dominantly constructed of striated muscles, which provide support to the lower urinary tract and the rectum. After RP, the external sphincter replaces the proximal sphincter in sphincteric function (Nitti, 2002). Unfortunately, most men have an underdeveloped external sphincter. Therefore, strengthening the external sphincter by practicing Kegel exercises may accelerate the return of continence (Dorey, 2005; Nahon, Dorey, Waddington, & Adams, 2006; Parekh et al., 2003).

**The Behavioral Perspective**

The perception of incontinence can range from mild urinary leakage of a few drops to total lack of urinary control. The behavioral responses in the modified HRI model allow the manifestation of UI after RP to be observable and measurable as patients express their physiologic condition to the environment (Carrieri-Kohlman et al., 2003). Measurement of incontinence and its severity after RP depends on how it is defined and perceived (Mettiln et al., 1997); therefore, severity of incontinence is highly variable. Direct and indirect methods of assessing UI after RP are available.

A direct way of measuring UI after RP is an objective pad test. This test measures the difference in weight before and after wearing an incontinence pad for one hour (Smither et al., 2007). Another objective assessment of urinary symptoms is urodynamic testing (Kielb & Clemens, 2005; Sekido, Hinotsu, Kawai, Shimatzui, & Akaza, 2006). Although an objective pad test is invasive (the bladder is filled via catheters to measure bladder muscle wall compliance and stability) it helps to discern whether incontinence is because of bladder dysfunction or sphincteric weakness.

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![Figure 2. Lower Urinary Tract Before Radical Prostatectomy](image1)

![Figure 3. Lower Urinary Tract After Radical Prostatectomy](image2)
questionnaire that focuses on the health-related quality of life of men diagnosed with prostate cancer (Wei, Dunn, Litwin, Sandler, & Sanda, 2000). The IIQ-7 is a reliable and valid instrument that measures the impact of UI on activities of daily life (Moore & Jensen, 2000); whereas, the ISI is a short, two-question tool that measures incontinence-related quality of life (Hanley, Capewell, & Hagen, 2001) and has been shown to correlate well with pad weighting tests and the IIQ-7 (Murphy et al., 2006). The extent to which UI affects patients may be assessed by using these questionnaires. Based on the results, nurses can develop strategies that optimize outcomes and maximize quality of life in this population.

Experiential Perspective

The experiential component of the HRI model refers to the lived experience and the patient’s interpretation of the events that occur because of the loss of continence. The interpretation of lived experiences is based on introspection, personal experience, and the derivation of shared meaning (Carrieri-Kohlman et al., 2003). Management strategies and coping mechanisms as well as the subsequent outcomes of UI after RP will depend, in part, on the lived experience.

Palmer, Fogarty, Somerfield, and Powel (2003) identified social, emotional, and physical effects that fall under the experiential realm of the human responses of men who are incontinent after RP. For example, patients may avoid social situations, feel embarrassed when an episode of incontinence occurs, and experience discomfort from exposure to urine (Palmer et al.). Burt et al., (2005) found that men who undergo RP anticipate urinary leakage and incontinence once the catheter is removed, describing men’s reactions to the urinary symptoms from “optimistic about its temporary nature, to frustration and embarrassment” (p. 886). Embarrassment seems to be a fairly universal response in men who suffer from incontinence (Burt et al.; Maliski et al., 2001; Palmer et al., 2003; Palmer, 2004). However, most men will consider successful management of incontinence as the effective concealment of UI from others. Success in dealing with incontinence does not necessarily mean that men remain dry, but rather, remain in control (Maliski et al.).

Although most men notice improvements in incontinence control during the first few weeks following removal of the catheter, they tend to continue to have a fear of ongoing incontinence (Burt et al., 2005). The fear is magnified by a sense of lack of control. Because UI has been identified as a salient characteristic in several qualitative studies (Maliski et al., 2001; Palmer et al., 2003; Phillips et al., 2000). Having no control over continence means much more than having to limit social interactions and outings; men with UI express having no control over their own bodily functions. Therefore, nurses need to include the experiential perspective in their assessments of these patients.

Personal Factors

Personal factors are inherent to the person in question and influence the responses to illness (Carrieri-Kohlman et al., 2003). Personal factors are classified as nonmodifiable and modifiable.

Nonmodifiable personal factors: Nonmodifiable personal factors refer to intrinsic vulnerabilities that affect UI after RP, including stage of disease, age, prior urinary problems, comorbidities, and past experiences. For example, the diagnosis of an advanced, nonmetastasized cancer can be a risk factor for UI because it often requires more aggressive surgical techniques. Although this reduces the possibility of leaving cancerous margins behind, it also increases the risk for UI after RP (John, Hauri, Leuener, Reinecke, & Maake, 2001; Lowe, 1996; van Randenborgh et al., 2004).

Age as a risk factor for UI after RP has been studied widely; however, results are conflicting. For example, although Eastham et al. (1996) and Stanford et al. (2000) found older men to be more likely to suffer from incontinence after RP, Gobuloff et al. (1998) and Wille, Heindereich, von Knobloch, Hofmann, and Engelmann (2006) did not find age to be a risk factor for UI. Furthermore, Rogers et al. (2006) found that older men are no more likely to suffer from UI but tend to regain urinary continence later than younger men after RP.

Physiologic factors that affect older men may be at play. Factors such as reduced bladder capacity and increased urine production at night in older men may be detrimental to the achievement of continence after RP (Palmer, 2004). Further research clearly is needed to clarify the significance of the relationship between age and UI after RP. Nonmodifiable factors that may seem to be a hindrance in the attainment of continence, however, are not necessarily a predictor of permanent incontinence.

Modifiable personal factors: Modifiable personal factors influence the management and adaptation of the patient to UI after RP. Modifiable personal factors are highly dependant on motivation to seek improvement of UI. These factors may include strategies such as increasing knowledge regarding UI, asking questions, and joining peer support groups. For example, Mishel et al. (2002) found that, by increasing patient knowledge regarding the side effects of prostate cancer treatment, patients reduced their level of uncertainty and learned new cognitive and behavioral skills during the time of highest symptom distress following prostate cancer treatment.

Environmental Factors

Environmental factors are variables external to the patient that can have synergistic or constraining properties related to the attainment of urinary continence and influence how a man deals with UI after RP. Examples of environmental factors include RP surgical technique, surgeon’s experience performing RP, social support network, a physically demanding job, insurance coverage, availability of restrooms, and expense or availability of continence products.

In a recent literature review, Cambio and Evans (2006) found that the technique used to perform RP seems to affect continence control. For example, laparoscopic RP was associated with an earlier return of continence status when compared to retropubic RP; however, continence attainment rates were similar for both techniques at one year after the operation. Several techniques for performing RP have been associated with lower probabilities of UI after RP. Techniques such as trigonal preservation RP (John et al., 2001), bladder neck preservation RP (Lowe, 1996), and urethral length maximization RP (van Randenborgh et al., 2004) all reportedly are effective. However,
Management of Urinary Incontinence After Radical Prostatectomy

Nonpharmacologic management is the first line of interventions aimed at improving UI after RP and focuses on patient education. McGlynn et al. (2004) found that education targeted to the specific needs of patients with prostate cancer managing incontinence after RP resulted in very high levels of satisfaction in almost all patients. Palmer (2003) (see Figure 4) identified four major themes in patient-initiated management of incontinence-related stressors: preventing incontinence, improving continence, anticipating leakage, and coping with complete lack of control.

Preventing incontinence means that men have to be aware of the triggers of incontinence (Palmer, 2003). That is, men are more likely to void more frequently to keep their bladders empty, drink less fluid, or avoid physical positions that encourage voiding. Improving continence often can be achieved by performing Kegel exercises. Men who see improvement are more enthusiastic and receptive to performing Kegel exercises regularly (Maliski et al., 2001). Anticipating leakage is a strategy aimed at keeping incontinence supplies close at hand at all times; men can carry extra pads or a change of clothes in their car trunk or golf bags (Palmer et al.). Coping with complete lack of control was identified as the most energy-consuming task (Palmer et al.). Men in this category tend to try a host of different methods to deal with incontinence, including collagen injections, medications, and condom catheters or leg bags (Palmer et al.). However, Joseph (2001) cautions that the effectiveness of condom catheters may prevent men from actively seeking the return of continence because they no longer appreciate the need to regain continence.

Biofeedback and electric stimulation for the treatment of UI are considered behavior modification techniques because they provide awareness of a bodily function. These strategies may be used in conjunction with pelvic floor therapy. Abdelghany et al. (2001) found biofeedback and electric stimulation to be effective in treating patients with UI. However, in a literature review by Nahon et al. (2006), neither biofeedback nor electric stimulation provided conclusive evidence of effectiveness for treating UI after RP. In a recent randomized controlled trial, Zhang, Strauss, and Siminoff (2007) found that 71% of the 14 men who practiced Kegel exercises and participated in a support group that encouraged compliance in performing the exercises reported greater control over the urge to urinate and prevent leakage after three months, compared to 39% of the 15 participants from the control group who performed pelvic floor exercises exclusively.

Behavior training, bladder training, and lifestyle modifications encompass a variety of interventions. Although these interventions are used broadly by continence programs (Burgio, 2004), Nahon et al. (2006) suggested that current practice of these interventions is being done without evidence-based research, and further research is needed in these areas. Furthermore, the value of these interventions remains unclear as Hunter, Glazener, and Moore (2007) concluded in a Cochrane Review that urinary symptoms after RP improved over time, regardless of treatment.

Pharmacologic management is aimed mainly at stabilizing the detrusor muscle by the use of anticholinergic medications, such as duloxetine. However, these medications should only be used when the cause is assessed as being bladder dysfunc-
tion (Filocamo et al., 2007; Peyromaure et al., 2002) because they are not free from controversy; side effects range from dry mouth to supraventricular tachycardia (Blaivas & Groutz, 2002).

Surgical management is an option for men who suffer from severe and long-standing UI who are not completely satisfied with the results of nonpharmacologic and pharmacologic interventions. Therefore, surgery usually is an intervention of last resort (Migliari, Pistolesi, Leone, Viola, & Trovarelli, 2006; Tse & Stone, 2003). Surgical management options include artificial urinary sphincter implants, male bulbourethral sling implants, and injection therapy. Implants have the best reported results, whereas short-term improvements have been reported for injection therapy (Peyromaure et al., 2002). Therefore, nurses should educate patients about these options, provide information, and refer to physicians for further treatment.

**Figure 4. Patient-Initiated Management of Incontinence-Related Stressors**

Note. Based on information from Palmer et al., 2003.

### Preventing Incontinence
- Increase voiding frequency.
- Avoid positions that encourage the urge to void.
- Decrease fluid intake.

### Improving Continence
- Kegel exercises
- Biofeedback and electrical stimulation

### Anticipating Leakage
- Carry extra incontinence supplies, towels, and clothes.
- Know where public washrooms are located

### Coping With Complete Lack of Control
- Collagen injections, artificial sphincter implants, medications, and leg bags

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Implications for Nursing Practice

Nurses are crucial in fostering behaviors that will enhance the management of UI after RP. According to the modified HRI model, clinical assessment and management of incontinence after RP is grounded in physiologic, pathophysiologic, behavioral, and experiential perspectives as well as personal and environmental factors. Within this framework, knowledge gained related to the human response of UI following RP will be critical to the development of strategies that foster self-care skills and optimize individual adaptive outcomes.

Within the modified HRI model, nursing assessment should be gleaned from behavioural and experiential perspectives and personal and environmental factors. The behavioral perspective includes an objective assessment of UI, which may be accomplished by measuring the number of pads wet per day or week as well as the use of questionnaires related to incontinence. This information provides a baseline for nurses to use in the ongoing evaluation of interventions and outcomes. The experiential perspective provides subjective data for the assessment. Personal and environmental factors would be elicited in the medical and social history and include information on comorbidites, previous voiding patterns, and family support systems.

Clinical management of UI should be based on individualized interventions that are derived from the assessment. Therefore, assessment and management of UI after RP should aim at setting realistic goals that are attainable based on the circumstances. For instance, when a patient chooses to perform Kegel exercises as part of his management routine, the nurse also should suggest to him that joining a UI support group for patients who received RP that encourages compliance in pelvic floor exercises may further improve urinary control (Zhang et al., 2007). However, the nurse also must warn that performing Kegels does not necessarily guarantee the return of continence.

Skin breakdown around the perineal area because of exposure to urine can be an uncomfortable and embarrassing issue that many men choose to ignore. Nurses must be reassuring and encourage patients to be forthcoming in seeking treatment for the affected area, when keeping dry and clean do not produce positive results.

Environmental factors at home, such as traversing a flight of stairs to reach the bathroom, may be inconvenient when the patient is awake but it may even be more so after the patient goes to bed. Suggesting men use urinals at the bedside to relieve themselves may decrease the chances of wetting. However, if the patient has pets at home, they should be kept at a safe distance from a filled urinal.

Patients may feel isolated because of a decrease in participation in social activities. Wives or partners become an important social liaison for men. Nurses can suggest spouses or partners to host gatherings in their own homes to keep patients socially active.

A patient’s spouse or partner also may be greatly affected by his UI. For example, some couples who have been sharing the same bed for years may choose to sleep separately. The psychoemotional needs of couples should be explored and counselling, when appropriate, should be given.

Patients may feel overwhelmed with the variety of UI products available. Furthermore, use of such products may become an economic burden for some patients, as many will require several pads per day. Patients should be aware that generic brands are available and that more expensive products may not necessarily provide better protection.

Patients who do not show signs of improvement over an extended period of time (as determined by the patient’s goals) should be made aware of the pharmacologic and surgical management options available. Referrals to their physicians should be planned if they choose to follow these management options.

In addition to the educational and supportive roles, nurses are in the position to carry out a holistic evaluation of the patient and tailor ongoing interventions aimed at improving continence. This evaluation is based on the feedback loop of the modified HRI model. Whether management of UI includes nonpharmacologic, pharmacologic, or surgical strategies, the nurse should monitor and evaluate the outcomes of interventions, which will be manifested in the behavioral and experiential domains of the HRI model. Subsequent interventions to further improve management of incontinence will be initiated, depending on each successive assessment, intervention, and outcome cycle.

Finally, nurses should seek ongoing opportunities to attain further knowledge related to UI after RP as well as share their knowledge with peers. Further research in the area of UI after RP also is needed to improve the overall outcomes for patients. Nurses that care for these patients can play an important role in facilitating education and research by keeping an open channel of communication with other healthcare professionals, identifying researchable questions, and participating in the research process.

Conclusion

Although more innovative RP techniques are being developed to preserve continence, many men are still affected with UI following RP. The HRI model provides a comprehensive organizing framework to gain an understanding of the different factors that affect men with this problem. By using this model, clinical practice nurses can effectively assess these patients and design and apply interventions that will foster positive adaptation techniques and optimize outcomes.

Author Contact: Wellam F. Yu Ko, RN, can be reached at wellamyuko@hotmail.com, with copy to editor at CJOINditor@ons.org.

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