Urinary Incontinence After Stroke
Identification, Assessment, and Intervention by Rehabilitation Professionals in Canada

Chantale Dumoulin, PhD; Nicol Korner-Bitensky, PhD; Cara Tannenbaum, MD, MSc

Background and Purpose—Urinary incontinence (UI) is a common and distressing problem after stroke. Although there is evidence of new, effective UI poststroke rehabilitation intervention, it is unknown whether occupational therapists (OTs)’ and physical therapists (PTs)’ actual practices reflect best practices. We sought to determine the extent to which OTs and PTs identify, assess, and treat UI after stroke and to identify personal and organizational predictors of UI problem identification, best-practice assessment, and intervention.

Methods—Six hundred sixty-three OTs (93% participation rate) and 656 PTs (87% participation rate) working in stroke rehabilitation in Canada were randomly selected and interviewed with a telephone-administered questionnaire. Each responded to a series of open-ended questions related to a generated case (vignette) of a typical client with stroke who was experiencing UI.

Results—Only 39% of OTs and 41% of PTs identified UI after stroke as a problem. Fewer than 20% of OTs and 15% of PTs used best-practice assessments, and only 2% of OTs and 3% of PTs used best-practice interventions. Working in Ontario, having allocated learning time, and doing university teaching were among the variables explaining between 6% and 9% of the variability in UI identification and assessment.

Conclusions—Canadian OTs and PTs do not routinely identify poststroke UI as a problem, and best-practice assessments and interventions are underused. (Stroke. 2007;38:2745-2751.)

Key Words: evidence-based practice ■ rehabilitation ■ stroke ■ urinary incontinence

Urinary incontinence (UI) is a major problem after stroke, with a prevalence ranging from 37% to 79% in the days and weeks after the infarct. One year after stroke, approximately one third of these individuals remain incontinent, and UI is a strong predictor of functional recovery, discharge destination, and resumption of social participation.

There are 3 poststroke UI disorders that can be affected by occupational therapy and/or physical therapy intervention: urge (UUI), functional (FUI), and stress (SUI). UUI is the complaint of involuntary leakage accompanied by or preceded by urgency that can result from a stroke-related infarct or cerebral edema affecting central micturition pathways. FUI is the inability to maintain continence because of functional impairments, such as hemiparesis or impaired mobility, and environmental barriers, such as reduced toilet accessibility. SUI is the complaint of involuntary leakage on effort, sneezing, or coughing. SUI often precedes stroke onset but is typically exacerbated after stroke by repeated coughing associated with dysphagia and aspiration.

Although no stroke-specific UI rehabilitation assessments exist, the International Consultation on Incontinence recommendations suggest a protocol including a urinary diary, symptoms and quality-of-life, UI-specific questionnaires, a physical examination including pelvic floor evaluation, an evaluation of toilet transfer, and the need for adaptive equipment. There are also stroke-specific and generic functional measures that include items related to toileting.

Management of UI after stroke includes the use of supportive devices and behavioral, pharmacological, and surgical interventions. Behavioral interventions include timed voiding, prompted voiding, bladder retraining with urge suppression, pelvic floor muscle training, and compensatory rehabilitation approaches. Recommendations from the Agency for Health Care Policy and Research Guidelines and the International Consultation on Incontinence indicate that the least invasive UI intervention, behavioral management, should come first.

For UUI, there is evidence, albeit limited, that bladder retraining with urge suppression in combination with pelvic floor muscle exercises results in reduction of UI after stroke. For FUI, 1 fair-quality, randomized, clinical trial has shown a functional rehabilitation approach to be more effec-

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tive than a remedial approach. For SUI, there is evidence from 1 fair-quality, randomized, clinical trial that pelvic floor muscle exercise has a significant effect in females after stroke. Thus, although management has fallen primarily on nurses and physicians, there is emerging evidence supporting the need for an interdisciplin ary approach incorporating occupational therapists (OTs) and physical therapists (PTs). OTs have the expertise to play a strong role in reducing UI severity that is related to environment factors and specific needs for aids and adaptations. PTs can intervene with mobility and transfers that exacerbate UI-related problems and have expertise in pelvic floor muscle training.

A review of the literature identified no studies regarding UI-related rehabilitation practices after stroke. This study therefore reports stroke-related UI rehabilitation practices of Canadian OTs and PTs, with the specific goals of identifying the detection of UI after stroke as a problem in those who are affected; the use of best-practice assessments and interventions related to UI management; and the relation between personal and organizational variables that have been shown to be associated with practice behaviors and variations in problem identification, assessment, and intervention practices.

Subjects and Methods
Research Design
A cross-sectional, Canada-wide telephone survey was undertaken to investigate UI practice patterns of OTs and PTs working with patients across the continuum of stroke care. Prompted by a case vignette depicting a typical patient with stroke being treated in either acute care, inpatient rehabilitation, or community outpatient services, clinicians were asked to identify problems, assessments, and interventions that they would use. Ethics approval was provided by the institutional review board, Faculty of Medicine, McGill University, Montreal, Canada.

Sample Size Considerations
Sample sizes were based on the estimate that 20% of therapists would use interventions with high evidence of effectiveness. With a 2-sided CI of 95% and a desired precision of 6%, ~200 therapists per discipline per UI type were required to allow stable prevalence estimates.

Study Population
The goal was to accrue a representative random sample of OTs and PTs working across the continuum of stroke care in Canada. The Canadian professional associations and provincial licensing bodies provided lists of clinicians working in adult neurology. In smaller provinces, the orders provided hospital names and community clinics. Disproportional sampling was used to ensure sufficient numbers by province and setting.

Clinicians were eligible if they were registered with the licensing body; had worked in stroke rehabilitation ≥3 months during the year; had worked in the previous 6 months; had treated ≥2 adult clients with a primary diagnosis of stroke per month; spoke English or French; and provided informed consent.

Development of the Clinical Vignette and Interview Questionnaire
Previous work has demonstrated that case studies are a valid form of treatment ascertainment. Using focus-group methodology, vignettes representing the different environments in which clinicians practice were developed by stroke clinicians and researchers, taking into consideration the different phases of stroke rehabilitation and different types of UI (SUI, UUI, and FUI). Vignettes were created in either English or French and then translated according to standard procedures, after which they were pilot-tested on 5 clinicians.

In the acute-care vignette, the sentence, “The spouse expresses concern that P. leaks a small amount of urine when coughing and sneezing” was used to represent SUI. In the rehabilitation vignette, UUI was represented by “The nursing staff noted that J. is often in a great hurry to get to the bathroom and doesn’t always make it on time.” In the community vignette, the FUI-related sentences included “C. ambulates at a slow pace with assistance of a quad cane” “Last week, C. fell while in the bathroom”; and “Since the stroke, C. does not always make it to the bathroom on time.”

The interview questionnaire was designed according to Dillman’s guidelines. We have used a similar version successfully in a previous study of low back pain. Because it was adapted slightly for this study, the questionnaire was again reviewed for face validity and pretested on 6 clinicians. Questionnaire components included personal and organizational characteristics; the clinical vignette pertinent to the clinician’s work setting; and questions related to the clinician’s actual practices, including the problems identified in the patient depicted in the vignette, as well as the assessments and interventions that the clinician would use.

Tracing, Recruiting, and Interviewing Participants
Rigorous tracing procedures were implemented. Once contacted, the clinician was screened for eligibility. The project was described, and those who were eligible and consented were scheduled for a telephone interview. The vignette matching the clinician’s work environment, an explanatory letter ensuring confidentiality, and a request not to divulge the contents of the study were forwarded to participants 24 to 48 hours before the interview. Ten interviewers were extensively trained and provided with written guidelines to follow when performing the interviews and responding to clinician queries. Responses to the interview were numerically coded and entered in a management system.

Data Analysis
Descriptive statistics were used to indicate the prevalence of problem identification, assessment, and intervention use, by discipline and UI type. Problem identification was operationally defined in 2 ways: “UI problem identifier,” to denote a clinician who used a UI-related term, and “specific UI type problem identifier,” to denote a clinician who identified the specific UI type (Table 1). Assessment use was also operationally defined in 2 ways: “UI assessment user,” to denote a clinician who indicated any UI assessment, and “best-practice UI assessment user,” to denote a clinician who identified best-practice assessment(s). The term “UI intervention user” denoted a clinician who used any form of UI intervention, whereas “best-practice UI intervention user” denoted a clinician who identified best-practice intervention(s) for the specific UI described. Finally, a clinician who identified all 3 aspects of UI management, the problem, best-practice assessment, and best practice-intervention, was termed a “best-practice user” with prevalence calculated by discipline.

Univariate analyses examined the association between 23 potential explanatory variables and being a UI problem identifier and best-practice UI assessment user, for OTs and PTs independently. Personal predictors were sex, age, degree, year of graduation, years of experience with stroke patients, province of practice, work schedule (part versus full time), hours treating daily, number of stroke patients seen daily, vignette type (SUI, UUI, or FUI), specialty certification, and university teaching. Organizational predictors were work setting (inpatient, outpatient, or community), work location (urban, suburban, or rural), and yes/no to the following items: provide student placement, teaching institution, research in setting, nurse in practice, social worker in practice, interdisciplinary team, allocated learning time, funds for learning, and easy access to new information. Given the multiple correlations, the probability value was set at 0.01 with a Bonferroni correction.

Next, 4 logistic-regression models, with stepwise backward elimination and iterative modeling of variables, were used to determine which combination of variables predicted being an OT or PT “UI problem identifier” and “best-practice UI assessment user.” The
prevalence of the outcome “UI intervention user” was insufficient to allow logistic-regression analyses. Independent variables with a univariate significance \( P < 0.10 \) with the outcome were included. Results for significant predictors are reported using odds ratios and 95% CIs.

### Results

**Respondents**

The survey was completed in 2004 to 2005, with 1072 OTs contacted, 290 ineligible, 71 untraceable, and 48 refusing: thus, 663 of 711 (93%) of eligible OTs participated. For PTs, 1024 were contacted, 171 were ineligible, 99 were untraceable, and 98 refused: 656 of 754 (87%) of eligible PTs participated. Table 2 summarizes the sociodemographic characteristics of participants per discipline and setting.

**Clinician Practices**

Table 3 presents the prevalence of UI identification, best-practice assessment, and intervention. A similar proportion of OTs and PTs identified a UI problem, but type-specific UI identification was rare. UI assessment was uncommon, as was intervention. Fewer than 1% of clinicians were classified as “best-practice users.”

### Variables Associated With Identification of UI and Use of Best-Practice Assessments

For OTs, a univariate analysis of factors associated with being a “UI problem identifier,” showed a significant effect of vignette type: 53.5% of those who answered an SUI acute-care vignette were identifiers versus 29.6% of those responding to the UUI rehabilitation and 37.0% of those responding to the FUI community vignette (\( \chi^2 = 26.02, P = 0.001 \)). For PTs, vignette type was again associated: 50.9% of those answering an SUI acute-care vignette were identifiers versus 36.8% answering the UUI rehabilitation and 34.6% answering the FUI community vignette (\( \chi^2 = 13.82, P < 0.001 \)). PT identifiers compared with nonidentifiers were also more likely to have a social worker in their setting, 82.3% versus 71.4% (\( \chi^2 = 10.24, P = 0.001 \)).

Univariate analyses of factors associated with being a best-practice UI assessment user showed, for OTs, a significant effect of hours treating daily: 32.8% of those treating stroke patients for >2 hours daily were users versus 14.2% of those who treated <1 hour and 13.8% of those who treated 1 to 2 hours daily (\( \chi^2 = 30.63, P < 0.001 \)), and number of stroke patients seen daily: only 14.4% of those seeing <2 stroke patients daily were users versus 18.9% of those seeing 2 to 5 patients and 36.5% of those seeing ≥6 patients daily.
nurses and doctors have traditionally been responsible for UI and interventions are seldom used. It could be argued that this low prevalence of UI management is unimportant, given that work setting, work location, nurse in practice, research in setting, and easy access to new information.

Discussion

UI Detection, Assessment, and Intervention

Canadian rehabilitation professionals do not routinely identify UI after stroke. Furthermore, best-practice assessments and interventions are seldom used. It could be argued that this low prevalence of UI management is unimportant, given that nurses and doctors have traditionally been responsible for UI.

Multivariate analysis (Table 4) showed that vignette type (SUI acute-care versus FUI community) and presence of student placement explained 6.5% of the variability in UI problem identification for OTs. For PTs, 3 factors, vignette type (SUI acute-care versus FUI community), allocated learning time, and the presence of a social worker in the practice, were significantly associated with UI problem identification. The final model explained only 5.8% of the outcome.

For OTs, the model that best explained being a best-practice UI assessment user (Table 3) included working in Ontario versus the other provinces (27.3% of Ontario OTs were users versus 15.6% in other provinces), working full time versus part time, and hours treating daily (>2 hours versus <1 hour), which together explained 9.0% of the variability in the outcome. For PTs, hours treating daily (>2 hours versus <1 hour), vignette type (UUI rehabilitation versus FUI community), and undertaking university teaching explained 8.4% of the variability.

Table 2. Characteristics of Respondent by Discipline, UI Type, and Clinical Setting

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>OTs (N=663)*</th>
<th>PTs (N=656)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SUI Acute Care</td>
<td>UUI Rehabilitation</td>
</tr>
<tr>
<td></td>
<td>(n=223)</td>
<td>(n=253)</td>
</tr>
<tr>
<td>Mean age, y (SD)</td>
<td>35.47 (8.13)</td>
<td>36.67 (9.19)</td>
</tr>
<tr>
<td>Women, n (%)</td>
<td>168 (91.8)</td>
<td>231 (91.3)</td>
</tr>
<tr>
<td>Training, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma, entry level</td>
<td>3 (1.6)</td>
<td>11 (4.3)</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>168 (91.8)</td>
<td>231 (91.3)</td>
</tr>
<tr>
<td>Master’s and doctoral degrees</td>
<td>12 (6.6)</td>
<td>11 (4.3)</td>
</tr>
<tr>
<td>Full-time work, n (%)</td>
<td>143 (78.1)</td>
<td>195 (77.1)</td>
</tr>
<tr>
<td>Years of experience, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3</td>
<td>53 (29.3)</td>
<td>76 (30.2)</td>
</tr>
<tr>
<td>4–10</td>
<td>69 (38.1)</td>
<td>80 (31.7)</td>
</tr>
<tr>
<td>&gt;10</td>
<td>59 (32.6)</td>
<td>96 (38.1)</td>
</tr>
<tr>
<td>Stroke patients seen daily, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>75 (41.2)</td>
<td>52 (20.6)</td>
</tr>
<tr>
<td>2–5</td>
<td>90 (49.5)</td>
<td>144 (56.9)</td>
</tr>
<tr>
<td>≥6</td>
<td>17 (9.3)</td>
<td>57 (22.5)</td>
</tr>
<tr>
<td>Hours treating daily, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>79 (43.6)</td>
<td>68 (26.9)</td>
</tr>
<tr>
<td>1–2</td>
<td>73 (40.3)</td>
<td>69 (27.3)</td>
</tr>
<tr>
<td>&gt;2</td>
<td>29 (16.0)</td>
<td>116 (45.8)</td>
</tr>
<tr>
<td>Teaching institution, n yes (%)</td>
<td>127 (68.9)</td>
<td>166 (63.6)</td>
</tr>
<tr>
<td>Allocated learning time, n yes (%)</td>
<td>57 (31.1)</td>
<td>91 (36.0)</td>
</tr>
</tbody>
</table>

*Ns vary slightly due to missing data.

\(\chi^2=20.28, P<0.001\). For PTs, vignette type and hours treating daily were associated with being a user: of those answering a UUI rehabilitation vignette, 22.9% were users versus 8.4% of those answering an SUI acute-care vignette and 12.1% of those answering a FUI community vignette \(\chi^2=19.53, P<0.001\), and 21.5% of those treating 1 to 2 hours daily were users versus 8.6% of those treating <1 hour and 15.0% of those treating 1 to 2 hours daily \(\chi^2=14.26, P=0.001\).

In building the UI problem identifier logistic-regression models with variables that were univariately significant at \(P<0.10\), 5 were included for OTs: year of graduation, vignette type, research in setting, student placement, and funds for learning: 8 were included for PTs: age, vignette type, years of experience, specialty certification, work setting, social worker in the practice, interdisciplinary team, and allocated learning time. For the UI best-practice assessment user logistic-regression model, 11 variables were included for OTs: year of graduation, hours treating daily, sex, province of practice, vignette type, work schedule, number of stroke patients seen daily, work setting, student placement, nurse in practice, and research in setting; 11 were included for PTs: hours treating daily, province of practice, vignette type, years of experience, number of stroke patients seen daily, university teaching, work setting, work location, nurse in practice, research in setting, and easy access to new information.
management. Emerging scientific evidence\textsuperscript{16,17,18,19} that rehabilitation professionals play a key role in reducing the effect of poststroke UI and published UI recommendations indicating the need for multidisciplinary attention to continence care\textsuperscript{6,10} suggest otherwise.

Overall, the 23 potential explanatory variables were only minimally successful in identifying UI problem identifiers and best-practice assessment users for both OTs and PTs. Problem identification and best-practice assessment were related to vignette type. For example, PTs and OTs answering an SUI acute-care vignette were more likely to be UI problem identifiers than those answering the FUI community vignette. It is possible that rehabilitation professionals are more attuned to identifying SUI, which is worsened by effort and exertion required to participate in rehabilitation interventions and concomitantly affects concentration during treatment. Alternatively, it may be that those working in an acute-care setting are more vigilant about UI, considering that

\begin{table}[h]
\centering
\caption{Prevalence of Identification, Assessment, and Intervention by Discipline, UI Type, and Clinical Setting}
\begin{tabular}{lcccc}
\hline
 & OTs (N=663) & & & PTs (N=656) \\
 & SU Acute Care (n=183) & UUI Rehabilitation (n=253) & FUI Community (n=227) & SU Acute Care (n=202) & UUI Rehabilitation (n=223) & FUI Community (n=231) \\
\hline
Variable name & & & & \\
UI problem identifier, n (%) & 98 (53.55) & 75 (29.64) & 84 (37.00) & 103 (51.00) & 82 (36.77) & 80 (34.63) \\
Specific UI type & & & & \\
Problem identifier, n (%) & 5 (2.73) & 12 (4.74) & 34 (14.98) & 5 (2.48) & 13 (5.83) & 26 (11.26) \\
UI assessment user, n (%) & 32 (17.49) & 61 (24.11) & 38 (16.74) & 17 (8.42) & 51 (22.87) & 30 (12.99) \\
Best-practice UI & & & & \\
Assessment user, n (%) & 32 (17.49) & 61 (24.11) & 35 (15.42) & 17 (8.42) & 51 (22.87) & 28 (12.12) \\
UI intervention user, n (%) & 17 (9.29) & 30 (11.86) & 23 (10.13) & 15 (7.43) & 16 (7.17) & 7 (3.03) \\
Best practice & & & & \\
Intervention user, n (%) & 0 (0) & 0 (0) & 16 (7.05) & 8 (3.96) & 10 (4.48) & 4 (1.73) \\
Best-practice user, n (%) & 0 (0) & 0 (0) & 4 (0.60) & 1 (0.15) & 1 (0.15) & 1 (0.15) \\
\hline
\end{tabular}
\footnotesize{*Ns vary slightly due to missing data.}
\end{table}

\begin{table}[h]
\centering
\caption{Multivariate Analyses of Personal and Organizational Factors According to Problem Identification and Assessment by Discipline}
\begin{tabular}{lcccc}
\hline
 & OTs & & & PTs \\
 & OR* & 95% CI & Nagelkerke $R^2$ & OR* & 95% CI & Nagelkerke $R^2$ \\
\hline
UI problem identifier & 0.065 & & & 0.058 & & \\
Vignette type: FUI community vs SU Acute care & 1.94 & 1.29–2.93 & & 1.80 & 1.19–2.71 & \\
UUI rehabilitation & 0.68 & 0.46–1.01 & & 0.98 & 0.65–1.49 & \\
Student placement=yes & 2.22 & 1.07–4.64 & & N/A & & \\
Allocated learning time=\&yes & N/A & & & 1.42 & 1.01–2.00 & \\
Social worker=\&yes & N/A & & & 1.88 & 1.24–2.87 & \\
Best-practice UI assessment user & 0.090 & & & 0.084 & & \\
Province of practice=\&Ontario vs others & 1.73 & 1.07–2.78 & & N/A & & \\
Hours treating daily: \&<1 hour vs & & & & \\
1–2 hours & 0.93 & 0.55–1.56 & & 1.65 & 0.91–3.00 & \\
>2 hours & 2.51 & 1.53–4.12 & & 2.14 & 1.18–3.88 & \\
Work schedule=\&\&full vs part time & 1.72 & 1.04–2.84 & & N/A & & \\
Vignette type: FUI community vs SU Acute care & N/A & & & N/A & & \\
UUI rehabilitation & 0.69 & 0.36–1.31 & & 1.86 & 1.11–3.12 & \\
University teaching=\&yes & N/A & & & 1.93 & 1.08–3.44 & \\
\hline
\end{tabular}
\footnotesize{OR indicates odds ratio.}
\end{table}
it is a strong predictor of functional recovery and discharge destination.

In addition, PTs and OTs spending >2 hours treating stroke patients daily and PTs working full time versus part time were more likely to be best-practice UI assessment users, suggesting that those with greater stroke treatment experience may be more attuned at assessing for UI post-stroke sequelae.

Moreover, in each of the 4 logistic models, predictors related to education, such as opportunities for continuous learning, university teaching, and student placement, were associated with higher use of best practices. Finally, working in Ontario, a province that has stressed continuing education for clinicians through various strategies including the Ontario Stroke Strategy and where there is a large critical mass of OTs and PTs, was associated with the use of best-practice assessments.

Notwithstanding specific local initiatives, there is evidence that rehabilitation professionals generally receive little UI training. In England,27 88% of 548 OTs stated that they had a role to play in UI management, but only 35% were assessing clients and <23% received a continence-related curriculum during training. A 1998 Canadian survey28 of PT programs found that UI was taught in 81% of these but with an average of only 1 to 2 hours of theory. A more recent Canadian survey of 11 of 13 PT programs and 10 of 12 OT programs (Dumoulin, unpublished data, 2006) suggests this number has increased: PTs receive, on average, 5.36±5.02 hours of primarily theoretical content on UI, whereas OTs receive, on average, 3.1±1.26 hours, with varying ratios of theory and practice.

Our findings suggest that strategies are needed to encourage clinicians to increase their focus on UI management. The introduction of a structured assessment model would likely be a good starting point. The International Classification of Functioning, Disability and Health model of functioning and disability,29 with its 3 subdivisions (body structure and functioning, activities and participation, and environmental factors), may prove helpful in framing a patient assessment model, from specific body structure issues related to reduced pelvic floor muscle strength and tone associated with SUI to environmental factors such as toilet accessibility, and wheelchair and bed restraints that result in FUI. If clinicians are to change their UI-related practices, they need easy access to the emerging evidence.

**Potential Limitations**

A study using vignettes may overestimate or underestimate UI management. However, vignettes have been shown to be a valid means of determining actual practice; indeed, they are more accurate than chart abstraction.30 Also, given the random sampling and high rate of participation, it is likely these study findings can be generalized across Canada.

The fact that each UI type vignette was used in association with only 1 setting (SUI acute care, UUI rehabilitation, and FUI community) did not allow analysis of the interaction between UI type and setting. Given an ideal research design, we could have studied the clinician practices for the 3 different types of UI in the 3 different settings: the sample size needed would have grown to roughly 600 per site. It would be interesting to pursue this line of questioning in future studies.

In conclusion, Canadian OTs and PTs do not routinely identify poststroke UI as a problem, and best-practice assessments and interventions are underused, which is unfortunate, given the emerging evidence that UI can be favorably affected by a multidisciplinary approach. Overall, there is a need for strategies aimed at improving UI management by these 2 groups.

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**Disclosures**

None.

**References**


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