

# Inappropriate hospital use by patients receiving care for medical conditions: targeting utilization review



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## Abstract

**Objective:** To describe characteristics associated with inappropriate hospital use by patients in Manitoba in order to help target concurrent utilization review. Utilization review was developed to reduce inappropriate hospital use but can be a very resource-intensive process.

**Design:** Retrospective chart review of a sample of adult patients who received care for medical conditions in a sample of Manitoba hospitals during the fiscal year 1993–94; assessment of patients at admission and for each day of stay with the use of a standardized set of objective, nondiagnosis-based criteria (InterQual).

**Patients:** A total of 3904 patients receiving care at 26 hospitals.

**Outcome measures:** Acute (appropriate) and nonacute (inappropriate) admissions and days of stay for adult patients receiving care for medical conditions.

**Results:** After 1 week, 53.2% of patients assessed as needing acute care at admission no longer required acute care. Patients 75 years of age or older consumed more than 50% of the days of stay, and 74.8% of these days of stay were inappropriate. Four diagnostic categories accounted for almost 60% of admissions and days, and more than 50% of those days of stay were inappropriate. Patients admitted through the emergency department were more likely to require acute care (60.9%) than others (41.7%). Patients who were Treaty Indians had a higher proportion of days of stay requiring acute care than others (45.9% v. 32.8%). Patients' income and day of the week on admission (weekday v. weekend) were not predictive factors of inappropriate use.

**Conclusion:** Rather than conducting a utilization review for every patient, hospitals might garner more information by targeting patients receiving care for medical conditions with stays longer than 1 week, patients with nervous system, circulatory, respiratory or digestive diagnoses, elderly patients and patients not admitted through the emergency department.

## Résumé

**Objectif :** Décrire les caractéristiques de l'utilisation indue des hôpitaux par les patients du Manitoba afin d'aider à cibler des examens de l'utilisation concomitante. On a mis au point l'examen de l'utilisation afin de réduire l'utilisation indue des hôpitaux, mais le processus peut consommer énormément de ressources.

**Conception :** Examen rétrospectif des dossiers d'un échantillon de patients adultes qui ont reçu des soins pour des problèmes médicaux dans un échantillon d'hôpitaux du Manitoba au cours de l'exercice 1993–1994; évaluation des patients à l'admission et chaque jour pendant l'hospitalisation au moyen d'un ensemble normalisé de critères objectifs non fondés sur le diagnostic (InterQual).

**Patients :** Au total, 3904 patients qui ont reçu des soins à 26 hôpitaux.

**Mesures des résultats :** Admission active (appropriée) et non active (inappropriée) et durée en jours de l'hospitalisation des patients adultes qui ont reçu des soins pour des problèmes médicaux.

**Résultats :** Après une semaine, 53,2 % des patients qui avaient besoin de soins actifs selon l'évaluation faite à l'admission n'en avaient plus besoin. Les patients

## Evidence

## Études

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*This article has been peer reviewed.*

*Can Med Assoc J 1997;157:889-96*

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âgés de 75 ans ou plus ont consommé plus de 50 % des jours d'hospitalisation, dont 74,8 % n'étaient pas appropriés. Quatre catégories de diagnostic ont entraîné presque 60 % des admissions et des jours d'hospitalisation, dont plus de 50 % n'étaient pas appropriés. Les patients admis par l'urgence étaient plus susceptibles d'avoir besoin de soins actifs (60,9 %) que les autres (41,7 %). Les Indiens inscrits ont eu besoin pendant leur séjour, de plus de jours de soins actifs que d'autres patients (45,9 % c. 32,8 %). Le revenu des patients et le jour de la semaine où ils ont été admis (semaine c. fin de semaine) n'étaient pas des prédicteurs d'utilisation indue.

**Conclusion :** Au lieu de procéder à un examen de l'utilisation pour chaque patient, les hôpitaux pourraient recueillir plus de renseignements en ciblant les patients en médecine dont l'hospitalisation dure plus d'une semaine, les patients chez lesquels on a diagnostiqué des problèmes du système nerveux, des systèmes circulatoire, respiratoire ou digestif, les patients âgés et ceux qui ne sont pas admis par le service d'urgence.

Reviews of the appropriateness of hospital care consistently show that some proportion of the patients admitted do not require the services of an acute care institution. Utilization review has been developed to reduce inappropriate hospital use by assessing hospital records.<sup>1</sup> However, concurrent review of every patient admitted is very resource-intensive. This article presents some ideas for targeting utilization reviews involving adult patients receiving care for medical conditions (discussed below).

A 1993 review of inappropriate hospital use reported the results of 16 Canadian and international studies that used well-validated criteria and asked (1) Was the admission appropriate? and (2) Were subsequent days of stay appropriate?<sup>2</sup> In the international studies, from 7% to 43% of admissions for adults and from 20% to 48% of the days of stay for adults were inappropriate. In Canada, 3 studies of adult patients being treated for medical conditions showed that from 24% to 90% of admissions and from 27% to 66% of days of stay were inappropriate.<sup>3-5</sup>

At the Manitoba Centre for Health Policy and Evaluation (MCHPE), we recently reviewed patients receiving care for medical conditions in 26 Manitoba hospitals in 1993-94.<sup>6</sup> In our study, 51% of the admissions and 67% of the days of stay for adults with medical conditions were assessed as nonacute (inappropriate). Throughout this article, we will use the terms "acute" and "nonacute" rather than "appropriate" and "inappropriate," since patients may no longer require acute care, yet may remain in hospital because alternative care is unavailable. Only a small number of patients required no health care services (2% of admissions and 7% of days of stay); this indicates that most patients in hospital needed health care, but not necessarily at the level of an acute care hospital.

These studies identify widespread use of acute care hospitals by patients not requiring this level of care; hence, there is room for hospitals and the health care sys-

tem to become more efficient. However, undertaking case-by-case reviews is resource-intensive; we estimate that our cost was \$10 per record retrieved and abstracted. If we can identify more efficiently the patients who may use a large number of hospital days at a nonacute level of care, we can focus our planning accordingly.

We therefore conducted a retrospective chart review to determine whether patients needed inpatient acute care and to identify characteristics of patients who are more likely to have nonacute admissions and days of stay.

## Methods

### Sampling method

The target population consisted of patients for whom separations were issued from Manitoba hospitals in the fiscal year 1993-94 and for whom the most responsible diagnosis was a medical condition. Patients in hospital for obstetric or psychiatric care or surgical procedures were excluded. Patients receiving care for medical conditions accounted for 49% of the separations and 53% of the days of stay in 1993-94. There were 76 hospitals in total, divided into 5 categories: teaching, urban community, major rural, intermediate rural and small/multiuse.

Our sampling design needed: (1) to be able to estimate the proportion of acute admissions at each hospital with a margin of error of 0.08 with 95% confidence, and (2) to have sufficient statistical power (80%) to detect a difference of 0.08 in the proportion of acute admissions among categories of hospitals. A sample size of 150 from each hospital satisfies (1) and of 813 from each category of hospital satisfies (2). As well, to meet the second condition, we needed to sample patients from 6 hospitals in each category. Since there are only 2 teaching hospitals, we decided to combine the teaching with the urban community category and sample all 8 hospitals in this category, yield-



ing a total of 26 hospitals to be sampled; 3904 charts were reviewed. Therefore, the sampling method involved 2 stages: cluster sampling of hospitals from each category, then random sampling of charts from each hospital.

### Assessment

We used 1993 InterQual ISD-A criteria<sup>7</sup> to assess whether the patient required acute care or not. Slight modifications were made to the criteria to reflect Manitoba practice after extensive review by the study Working Group — consisting of physicians, nurses, hospital managers and other health care professionals — and other Manitoba physicians. The criteria objectively assess whether inpatient acute care is needed, based on the patient's clinical characteristics and the specific services received. The InterQual criteria have several advantages: they are diagnosis-independent, so diagnostic errors do not affect the assessment; they have been broadly accepted by physicians as a reasonable measure of the need for acute care; they have been externally validated;<sup>8,9</sup> and they have been used in similar retrospective research.<sup>3-5,9-12</sup>

Registered-nurse abstractors assessed the patient's record at admission and for each subsequent day of stay; the admission review encompassed the first 72 hours of the patient's hospital stay. Each subsequent day of stay was assessed independently, irrespective of the findings of the admission review or of the review for any other day.

Data from the medical record abstracts were linked with the Manitoba Health Research Data Base. This database includes information from the hospital abstracts for all separations; previous work has shown these data to be a valid source of hospital information.<sup>13-15</sup>

To measure socioeconomic status, we used 1991 Canadian Census information on mean family household income in each enumeration area. Statistics Canada defines an urban enumeration area as an area having a population density greater than 400 persons per square kilometre. We used these data to rank Winnipeg neighbourhoods into income quintiles; income quintiles are less applicable in rural areas, so we excluded areas outside of Winnipeg in the income analyses. Patients who were Treaty Indians under the federal Indian Act are identified in the files by a municipal code beginning with an "A."

### Statistical methods

Inter-rater reliability (kappa)<sup>16</sup> was evaluated throughout the data-collection process, and 95% confidence intervals were calculated. We applied the Bonferroni method of adjustment for multiple significance testing.<sup>17</sup>

Upon final data collection, we tested our samples to verify that they were representative of the distribution of

each hospital patient population with respect to length of hospital stay, age, sex, region of residence, type of diagnosis and socioeconomic status. We used the  $\chi^2$  test, adjusting for multiple significance testing to control the Type I error, and found the sample to be representative of the population for each hospital at the 5% significance level. This test allowed us to generalize our findings to the overall population of patients with medical conditions in Manitoba hospitals in 1993-94, which we have done using appropriate weights.

We incorporated the design effects of complex sampling techniques<sup>18</sup> in estimating the 95% confidence intervals and testing hypotheses for the proportions of acute admissions and days. These confidence interval estimates were adjusted for multiple significance testing using the Bonferroni method. Our statistical inferences were based on the asymptotic normal distribution theory for rates and proportions.

## Results

### Inter-rater reliability

The overall kappa value for the pairs of abstractors (in 3 teams) ranged from 0.52 to 0.96, in the "fair" to "good" agreement range. At the beginning of the abstraction process, the paired abstractors were significantly different from being in perfect agreement with each other in 2 of the teams, but by the middle and end of the data-collection process, the paired abstractors in all of the teams were in agreement at a statistically significant level.

### Need for acute care by length of stay

The Working Group suggested that patients assessed as requiring acute care at admission would continue to require acute care initially, but would no longer meet the InterQual criteria in the later part of their hospital stay. We looked at the need for acute care for each of the first 28 days in hospital: we identified the proportion of patients for whom the first day of stay was for acute care, for whom the second day was for acute care and so on up to the 28th day. (Approximately 5% of the patients stayed more than 28 days, and these patients accounted for 36% of the study days.) Initially, we included only the 1530 patients who were assessed as requiring acute care at admission. The proportion of patients who required acute care declined rapidly in the first week; by the eighth day of their stay, only 46.8% (95% confidence interval [CI] 41.8% to 51.7%) of these patients needed acute care. After the 11th day, the proportion needing acute care declined more slowly, and, after 28 days in hospital, only 29.9% (95% CI 17.0% to 42.7%) of these patients



needed acute care. When we included all of the study patients, 49.5% required acute care at admission, 35.7% (95% CI 31.8% to 39.6%) required acute care on the eighth day of stay, and 21.7% (95% CI 12.4% to 31.0%) required acute care on the 29th day.

### **Need for acute care by age**

Patients were grouped into 8 age categories: 7 categories spanning 10 years each from age 15 to 84, and an eighth category for age 85 or older. Table 1 shows the distribution of patients by age group and the proportion who did not require acute care in each age category. Approximately 20% of the patients in the study were younger than 45 years, and these patients consumed 8.6% of the days reviewed, whereas 60% were 65 years of age or older and consumed 76.8% of the days reviewed. The 15-to-24 age group had significantly more nonacute admissions (68.6%) than the overall weighted proportion (50.5%). The overall proportion of days for nonacute care was 66.6%, but for the group 85 years of age or older, it was significantly higher (81.0%). Since older patients consume such a high proportion of the days, we also compared patients 75 years or older with those younger than 75 years. Older patients consumed a significantly larger proportion of days for nonacute care than younger patients (74.8% v. 59.3%, 95% CI for the difference 11.2% to 19.8%, indicating that older patients consumed at least 11.2% but at most 19.8% more days for nonacute care than younger patients).

### **Need for acute care by type of diagnosis**

We classified all admissions into diagnostic categories, according to the first 3 digits of the ICD-9-CM codes for most responsible diagnosis, to examine whether patients

with particular types of diagnoses were more likely to require acute care. Patients in 4 diagnostic categories — nervous system, circulatory, digestive and respiratory diagnoses — accounted for 59.7% of the admissions and 58.5% of the days of stay.

We compared diagnostic categories in which there were at least 200 admissions in our sample: nervous system, respiratory, circulatory and digestive diagnoses as well as those involving musculoskeletal and connective tissue, and kidney and urinary tract (Table 2). Patients with diagnoses related to musculoskeletal and connective tissue had higher than average admissions and days of stay for nonacute care. Patients with nervous system diagnoses used 15.9% of the days in our study, a high proportion of which (76.3%) were for nonacute care.

### **Need for acute care by emergency department admission**

In our study, 851 (22%) of the patients were admitted through an emergency department. These patients were significantly more likely to require acute care than those not admitted through an emergency department (60.9% v. 41.7%, 95% CI for the difference 14.7% to 23.7%).

### **Need for acute care by day of admission**

We examined the hypothesis that, because physicians' offices are generally closed on weekends, patients may be more likely to go to the hospital when they have a health problem, leading to lower proportions of admissions requiring acute care on weekends. We could find no evidence to support this theory. Although we found somewhat lower proportions of nonacute admissions on weekends (46.3%, 95% CI 41.8% to 50.8%) than on weekdays (51.7%, 95% CI 49.2% to 54.2%), the rate on weekends did not differ significantly from the overall rate of 50.5%.

**Table 1: Nonacute admissions and days of stay among patients in each age group receiving care for medical conditions**

Age group	Total no. of admissions	Nonacute admissions, % of all admissions* (and 95% CI)†	Total no. of days of stay	Nonacute days of stay, % of all days of stay* (and 95% CI)
15 to 24	237	68.6‡ (57.0–80.2)	669	68.7 (53.7–83.6)
25 to 34	266	47.9 (35.2–60.6)	956	48.0‡ (38.2–57.7)
35 to 44	263	48.7 (35.2–62.1)	1 218	48.0‡ (37.4–58.5)
45 to 54	343	53.4 (43.9–63.0)	1 941	53.6‡ (43.7–63.5)
55 to 64	473	50.6 (42.0–59.2)	2 854	59.2 (50.6–67.8)
65 to 74	807	46.1 (39.8–52.3)	6 897	62.5 (56.5–68.5)
75 to 84	1 015	50.3 (44.9–55.7)	11 434	70.9 (65.9–75.9)
85 or older	500	55.3 (46.3–64.3)	6 884	81.0‡ (74.6–87.4)
Overall	3 904	50.5	32 853	66.6

\*Percentages were weighted to account for different group sizes.

†CI = confidence interval.

‡Significantly different from overall proportion.



### Need for acute care by patient's socioeconomic status

Table 3 shows the proportion of admissions and days assessed as requiring acute care according to mean income in the patient's neighbourhood for residents of Winnipeg admitted to Winnipeg hospitals only (see Methods). For these patients, the overall proportion of nonacute admissions was 41.5% and of nonacute days was 62.0%. We found no significant difference between patients from the lowest-income and highest-income neighbourhoods. The proportion of nonacute admissions was 42.6% for patients in the lowest-income quintile and 42.7% for those in the highest-income quintile, and the proportion of days of stay for nonacute care was 64.9% for patients in the lowest-income quintile and 62.1% for those in the highest-income quintile.

### Need for acute care by Treaty Indian status

Only 251 (6.4%) of the admissions reviewed involved patients who were Treaty Indians. The proportion of ad-

missions assessed as requiring acute care was similar for Treaty Indians (48.6%) and all other patients (49.5%), but the proportion of days of stay for acute care was significantly higher for Treaty Indian patients. Almost half of their days were for acute care, compared with about one-third of the days for all other patients (45.9% v. 32.8%, 95% CI for the difference 3.2% to 22.9%).

## Discussion

We found that patients receiving care for medical conditions consumed a large proportion of days of stay in acute care hospitals when care could have been provided in alternative health care settings. Indeed, earlier research at MCHPE<sup>19</sup> showed that, with the closure of 18% of Winnipeg hospital beds from 1991 to 1993, remarkable changes were made in the treatment of patients needing surgery: inpatient surgery decreased 8%, the average length of stay fell 15% and outpatient surgery increased 24%. However, the number of separations for medical conditions fell only 3% and the length of stay decreased only 5%.

The results of this study suggest common characteris-

**Table 2: Nonacute admissions and days of stay for selected diagnostic categories among adults patients receiving care for medical conditions**

Diagnostic category	Total no. of admissions	Nonacute admissions, % of total admissions* (and 95% CI)	Total no. of days of stay	Nonacute days of stay, % of total days of stay* (and 95%CI)
Nervous system	335	55.9 (47.1–64.6)	5 222	76.3† (69.1–83.4)
Respiratory	567	34.7† (28.0–41.4)	4 899	62.5 (55.7–69.3)
Circulatory	875	45.5 (39.5–51.5)	5 733	54.8† (49.8–59.8)
Digestive	559	37.6† (30.4–44.8)	3 349	56.5† (50.4–62.6)
Musculoskeletal and connective tissue	285	76.3† (68.5–84.0)	3 137	78.6† (70.1–87.0)
Kidney and urinary tract	213	48.0 (35.9–60.1)	1 508	57.2 (46.8–67.5)
Total‡	3 904	50.5	32 853	66.6

\*Percentages were weighted to account for different group sizes.

†Significantly different from the overall proportion.

‡Diagnostic categories above do not sum to total because only diagnostic categories with more than 200 admissions were included in this table.

**Table 3: Nonacute admissions and days of stay by income quintile of neighbourhood of residence, patients living in Winnipeg and admitted to Winnipeg hospitals**

Income quintile	Total no. of admissions	Nonacute admissions, % in quintile* (and 95% CI)	Total no. of days of stay	Nonacute days of stay, % in quintile* (and 95% CI)
1 (lowest)*	234	42.6 (33.6–51.6)	2645	64.9 (56.9–72.9)
Q2	152	41.4 (30.6–52.3)	1505	55.8† (46.3–65.2)
Q3	164	37.8† (26.8–48.8)	1674	72.2‡ (63.1–81.2)
Q4	143	42.6 (32.1–53.1)	1186	50.5† (38.2–62.8)
Q5 (highest)	142	42.7 (32.0–53.4)	1339	62.1 (52.8–71.4)
Overall	835	41.5	8349	62.0

\*Percentages were weighted to account for different group sizes.

†Significantly different from overall Manitoba proportion.

‡Significantly different from overall Winnipeg proportion.



tics of patients receiving nonacute care; these may help to focus concurrent reviews and efforts to transfer patients to alternative health care settings (Table 4). Length of stay is one area to target: after the first week of stay, more than half of the patients who required acute care at admission no longer needed hospital care. Patients who stayed in hospital longer than 4 weeks (5% of patients) consumed 36% of the days in the study, about 75% of which were for nonacute care.

The patient's diagnosis is another relevant characteristic: patients with nervous system, circulatory, digestive and respiratory diagnoses accounted for 60% of the admissions and 59% of the days in the study. The proportion of days that were assessed as nonacute ranged from 54.8% for circulatory system conditions to 76.3% for nervous system diagnoses. Therefore, many of the patients in these diagnostic categories could be discharged or transferred earlier.

Age is another factor to consider. Older patients were just as likely to require acute care as younger patients at the time of admission. However, patients 75 years of age

or older consumed more than half of the days of stay, about 75% of which were not for acute care.

Contrary to expectations, we could find no increase in the proportion of nonacute admissions on weekends. In a result that may be related, we found that patients were more likely to require acute care when they were admitted through emergency departments, and that patients were more likely to be admitted through an emergency department on the weekend. Patients may make more use of emergency departments on weekends, when their physicians' offices are closed, but those that do visit the emergency department may be "sicker" or may be well screened by the emergency department, thereby limiting inappropriate admission.

People living in neighbourhoods with low socioeconomic status have poorer health, higher rates of admission to hospital and many more days of stay in hospital than those living in areas with higher socioeconomic status.<sup>19-25</sup> Despite evidence of their poorer health status, it has been suggested that low-income residents may overuse acute care hospitals and may be admitted for social reasons

**Table 4: Utilization review of patients receiving care for medical conditions: characteristics to help focus review efforts**

Area	What to look for	Comment
<b>To target</b>		
Length of stay	Stays longer than 1 week	By the eighth day of stay, 53% of patients who required acute care at admission no longer needed acute care
	Stays longer than 28 days	Only 5% of patients admitted stayed longer than 28 days, yet they used 36% of days, 76% of which were for nonacute care
Age	75 years or older	Older patients were just as likely to require acute care at admission as younger patients, but they consumed 56% of the days of stay, of which 74.8% were for nonacute care
Diagnostic category	Nervous system, circulatory, respiratory and digestive conditions	These 4 categories account for nearly two-thirds of admissions and days of stay; from 54.8% to 76.3% of days were for nonacute care
Mode of admission	Not through emergency department	Patients admitted directly by physicians, not through the emergency department, were less likely to require acute care
<b>NOT to target</b>		
Day of admission		The proportion of admissions that did not require acute care was similar on weekdays and weekends
Income		Although lower-income patients used more hospital days, the proportion of use for nonacute care was similar to that for high-income patients
Treaty Indian status		The proportion of appropriate use of acute care at admission was similar for Treaty Indian patients and other patients; Treaty Indian patients had higher levels of appropriate use for days of care than other patients



more often than for acute illness. In this study, as in others, there was a larger number of admissions and days of stay for patients in the lower income quintiles than for patients in the higher income quintiles. For patients living in the lowest-income neighbourhoods, there were 234 admissions and 2645 days of stay, whereas for those in the fourth and fifth quintiles (higher incomes), there were 143 and 142 admissions and 1186 and 1339 days of stay, respectively. However, our data show that the proportion of admissions and days of stay for acute care were similar among patients of all income levels.

Treaty Indians are often burdened with low incomes, poor housing and lack of employment, factors that have negative consequences for health. Furthermore, their discharge from hospital may be delayed to arrange transportation to remote communities, or because alternatives such as home care are not available on reserves. However, we found that the proportion of days of stay for acute care was significantly *higher* for Treaty Indians than for other patients. This was true of Treaty Indian patients in hospitals both within and outside Winnipeg.

These data strongly suggest that a commonly held perception that poor and aboriginal groups overuse the acute care hospital system is false; the proportion of admissions and days of stay for acute care was at least as high for these patients as for those from the most privileged neighbourhoods.

Because our sample was representative of Manitoba patients receiving care for medical conditions in the fiscal year 1993–94, we can extrapolate our findings to all Manitoba hospitals. That is, knowing what proportion of medical cases and days of stay were judged as needing nonacute care for each category of hospital, we can apply those estimates to medical cases and days of stay at all Manitoba hospitals. (Since we did not review patients receiving obstetric or psychiatric care or undergoing surgery, they are excluded from this calculation.) Our data suggest that as many as 34 000 (95% CI 26 000 to 41 000) admissions and 429 000 (95% CI 323 000 to 534 000) days of stay for all hospital care in 1993–94 could have been allocated to alternative health care services, assuming that such services were available.

## Conclusion

The recent movement to cut health care costs and to direct resources to community and home care alternatives has created incentives for earlier discharge. In the provincial government's most recent budget, the budget for the Ministry of Health increased less than 1% overall, but the budget for home care increased 13%.<sup>26</sup> In Alberta, although the health care budget was cut 25% from 1992 to 1995, funds were channelled into home care and commu-

nity care. There was a 50% increase in funding for these forms of care in Edmonton and Calgary (Dr. Clarence Guenter, cochair, Health Services Funding Advisory Committee for Alberta: personal communication, 1996). Incentives such as these will encourage earlier discharge. Concurrent utilization review, especially if it can be targeted, may provide direction for the establishment of alternatives and assist with discharge planning.

In short, providing adequate and accessible alternatives to acute hospital care could save money in the health care system, money that could help to preserve medicare. Knowing where to target efforts to reallocate health care resources could help to make utilization review — and hospital care — more efficient.

We thank the study working group: Marilyn Allen, Ross Brown, Evelyn Fondse, Sylvia Jennings, Sally Longstaffe, Barry MacMillan, Garry Mattin, Lois McMurchy, Marion Suski, Rose Unger, Cathy Winburn and Cornie Woelk.

This research resulted from a project undertaken for Manitoba Health by the Manitoba Centre for Health Policy and Evaluation and funded by the Province of Manitoba. Dr. Roos is a Career Scientist (6607-1001-48) with the National Health Research and Development Program and an Associate of the Canadian Institute for Advanced Research. Dr. Carrière is a Health Scholar (6607-1686-48) with the National Health Research and Development Program.

The results and conclusions are those of the authors, and no official endorsement by Manitoba Health is intended or should be inferred.

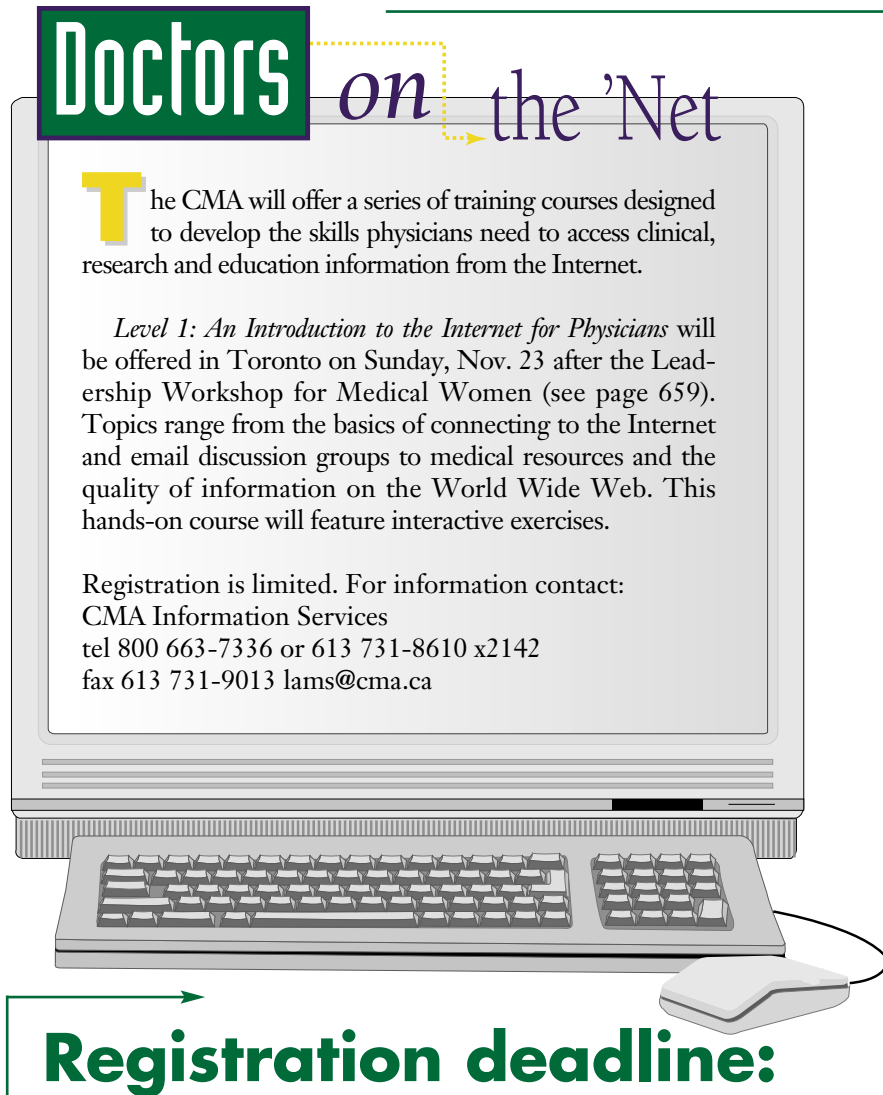
## References

1. Payne S. Identifying and managing inappropriate hospital utilization. *Health Serv Res* 1987;22(5):709-69.
2. Lavis JN, Anderson GM. *Inappropriate hospital use in Canada: definition, measurement, determinants and policy implications*. Ottawa: University of Ottawa; 1993.
3. Anderson G, Sheps S, Cardiff K. *Evaluation of Vi-Care: a utilization management program of the Greater Victoria Hospital Society*. Vancouver: University of British Columbia; 1993.
4. Health Services Utilization and Research Commission. *Barriers to community care*. Saskatoon (SK): Health Services Utilization and Research Commission; 1994.
5. Advisory Committee on Clinical Resource Management. *Acute medical beds: How are they used in British Columbia?* Victoria: British Columbia Ministry of Health and Ministry Responsible for Seniors; 1997.
6. DeCoster C, Peterson S, Kasian P. *Alternatives to acute care*. Winnipeg: Manitoba Centre for Health Policy and Evaluation; 1996.
7. Jacobs CM, Lamprey J. *Adult ISD criteria and review system*. North Hampton (NH): InterQual Inc.; 1993.
8. Strumwasser I, Paranjpe NV, Ronis DL, Share D, Sell LJ. Reliability and validity of utilization review criteria. *Med Care* 1990;28(2):95-111.
9. Smith CB, Goldman RL, Martin DC, Williamson J, Weir C, Beauchamp C, et al. Overutilization of acute-care beds in Veterans Affairs hospitals. *Med Care* 1996;34(1):85-96.
10. Ludke RL, MacDowell NM, Booth BM, Hunter SA. Appropriateness of admissions and discharges among readmitted patients. *Health Serv Res* 1990;25(3):501-25.
11. Strumwasser I, Paranjpe NV, Udow M, Share D, Wisgerhof M, Ronis DL, et al. Appropriateness of psychiatric and substance abuse hospitalizations. *Med Care* 1991;29(8 suppl):77-90.
12. Inglis AL, Coast J, Gray SF, Peters TJ, Frankel SJ. Appropriateness of hospital utilization: the validity and reliability of the Intensity-Severity-Discharge



- review system in a United Kingdom acute hospital setting. *Med Care* 1995;33(9):952-7.
13. Roos LL, Mustard CA, Nicol JP, McLerran DF, Malenka DJ, Young TK, et al. Registries and administrative data: organization and accuracy. *Med Care* 1993;31:201-12.
  14. Roos LL, Sharp SM, Wajda A. Assessing data quality: a computerized approach. *Soc Sci Med* 1989;28:175-82.
  15. Roos LL, Roos NP, Cageorge SM, Nicol JP. How good are the data? Reliability of one health care bank. *Med Care* 1982;20:266-76.
  16. Fleiss J. *Statistical methods for rates and proportions*. 2nd ed. New York: John Wiley and Sons; 1981.
  17. Steel RGD, Torrie JH. *Principles and procedures of statistics*. 2nd ed. New York: McGraw-Hill; 1980.
  18. Cochran WG. *Sampling techniques*. 3rd ed. New York: John Wiley and Sons; 1977.
  19. Brownell MD, Roos NP. *Monitoring the Winnipeg hospital system: update report 1993/94*. Winnipeg: Manitoba Centre for Health Policy and Evaluation; 1996.
  20. Frohlich N, Markesteyn T, Roos N, Carrière KC, Black C, DeCoster C, et al. *A report on the health status, socio-economic risk and health care use of the Manitoba population 1992/93 and overview of the 1990/91 to 1992/93 findings*. Winnipeg: Manitoba Centre for Health Policy and Evaluation; 1994.
  21. Andersen R, Chen M, Aday LA, Cornelius L. Health status and medical care utilization. *Health Aff* 1987;6:136-56.
  22. Benzeval M, Judge K, Solomon M. *The health status of Londoners: a comparative perspective*. London (England): King's Fund Institute, 1992.
  23. Marmot M, McDowell M. Mortality decline and widening social inequalities. *Lancet* 1986;2:274-6.
  24. Marmot M, Rose G, Shipley MJ, Hamilton PJS. Employment grade and coronary heart disease in British civil servants. *J Epidemiol Community Health* 1978;32:244-9.
  25. Billings J, Zeitel L, Lukomnik J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. *Health Aff* 1993;12:162-73.
  26. Government of Manitoba. *1997 Manitoba estimates of expenditures*. Winnipeg: Government of Manitoba; 1997.

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# Doctors on the 'Net

**T**he CMA will offer a series of training courses designed to develop the skills physicians need to access clinical, research and education information from the Internet.

*Level 1: An Introduction to the Internet for Physicians* will be offered in Toronto on Sunday, Nov. 23 after the Leadership Workshop for Medical Women (see page 659). Topics range from the basics of connecting to the Internet and email discussion groups to medical resources and the quality of information on the World Wide Web. This hands-on course will feature interactive exercises.

Registration is limited. For information contact:  
CMA Information Services  
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**Registration deadline:**