

## ABSTRACT

**Background:** Appropriate and timely provision of ambulatory care is an important factor in maintaining population health and in avoiding unnecessary hospital use. This article describes conditions for which hospitalization rates have a strong and inverse relationship to access to high-quality ambulatory care.

**Methods:** Three panels of Canadian physicians following different consensus techniques selected conditions for which the relative risk of hospitalization is inversely related to ambulatory care access.

**Principal Findings:** All panels identified asthma, angina pectoris, congestive heart failure, otitis media, gastric ulcer, pelvic inflammatory disease, malignant hypertension, and immunization-preventable infections as ambulatory care-sensitive admissions. These conditions strongly overlap with lists developed for similar purposes in the U.S. and England.

**Interpretation:** Ambulatory care-sensitive conditions represent an intermediate health outcome. They are distinct from inappropriate hospitalizations. They may be useful for measuring the impact of health care policy, and for performance measurement or audit.

## ABRÉGÉ

**Contexte :** La prestation individualisée et opportune de soins ambulatoires est un facteur important pour maintenir la santé de la population et éviter les séjours inutiles à l'hôpital. Notre article décrit les états de santé dont les taux d'hospitalisation présentent une forte relation inverse avec l'accès à des soins ambulatoires de haute qualité.

**Méthode :** Trois groupes de médecins canadiens suivant différentes techniques de concertation ont sélectionné les états de santé dont le risque relatif d'hospitalisation était en relation inverse avec l'accès aux soins ambulatoires.

**Principales constatations :** Les trois groupes ont déterminé que les admissions de cas d'asthme, d'angine de poitrine, d'insuffisance cardiaque globale, d'otite moyenne, d'ulcère gastrique, d'infection pelvienne, d'hypertension artérielle maligne et d'infections évitables par la vaccination étaient sensibles aux soins ambulatoires. Cette liste présente d'importants recoupements avec celles dressées aux États-Unis et en Angleterre.

**Interprétation :** Les états de santé sensibles aux soins ambulatoires sont à classer parmi les résultats de santé à moyen terme. Il faut les distinguer des hospitalisations inutiles. Ils peuvent servir à mesurer les incidences des politiques de soins de santé, ainsi qu'à des fins de vérification ou de mesure du rendement.

# Hospitalization for Ambulatory Care-Sensitive Conditions: A Method for Comparative Access and Quality Studies Using Routinely Collected Statistics

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Access to health care may be defined as the ability to obtain and benefit from care. Universal access to necessary care remains one of the chief goals of the health-care system in Canada.<sup>1</sup> Ambulatory care-sensitive conditions (ACSC) are a new negative indicator of access. The rate of hospitalization for ACSC is higher in communities with poor access to ambulatory care. This paper describes the development, using consensus panels, of a Canadian set of ACSC and compares them to similar categories of care developed elsewhere.<sup>2-4</sup>

## METHODS

### Questionnaire development

We identified nearly 400 4-digit *International Classification of Diseases 9<sup>th</sup> Revision* (ICD-9) diagnosis codes and over 150 3-digit *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures* (CCP) procedure codes with a potential relationship to health care access

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in English and French language articles, abstracts, and other source materials between 1972 to 1997 using the Medline, science citation, CINAHL, and Healthstar electronic databases, and manual searches of several clinical and public health journals. We excluded rare diagnoses and procedures (incidence of hospitalization <0.25/100,000 population in Ontario, 1992) from further consideration. We organized remaining potential ACSC into 33 diagnostic and 18 procedural groupings based on etiology, typical severity on admission to hospital, and common treatments. We entered these groupings into modified versions of questionnaires used by Billings et al.<sup>3</sup> The questionnaire asked respondents to rate: the effect of a patient's health behaviours, physical and social environment, and access to ambulatory and inpatient care on the relative risk of hospitalization for each clinical grouping. The questionnaire also asked respondents to rate the extent of geographic variation in the incidence of the condition(s) underlying each grouping and in the degree of professional consensus over the clinical indications for admission. (Copies available from ADB.)

### Consensus panel processes

We recruited by telephone 13 senior hospital and community-based physicians and surgeons practicing in a large urban centre to participate on a Delphi panel. Each panelist received an initial mailing with a description of the study, the questionnaire, and a stamped, addressed return envelope. Following the return of the questionnaire, we calculated the mean response

**TABLE I**  
**Panel Composition Across the Current and Previous Studies to Define Ambulatory Care-Sensitive Hospitalizations**

Canada (Current Study)			UK and USA (Previous Studies)	
<i>Delphi Panel (SW Ontario)</i>	<i>Modified Delphi Panel (SW Ontario)</i>	<i>Questionnaire Panel (Rural and Isolated Ontario Communities)</i>	<i>New York Modified Delphi Panel<sup>6</sup></i>	<i>Boston Consensus Panel<sup>5</sup></i>
7 academic hospital-based specialist physicians and surgeons	7 academic hospital-based specialist physicians and surgeons		6 academic hospital based specialist physicians	5 academic hospital-based specialist physicians
1 academic community-based specialist physician	1 academic community-based specialist physician			
5 academic community-based family physicians	4 academic community-based family physicians	11 non-academic community and hospital based family physicians*		

\* 4 additional community-based family physicians failed to return questionnaires.

and distribution of responses to each question. Each panelist then received individualized copies of a second questionnaire, a stamped and addressed return envelope, and additional description of the study. This second questionnaire included the frequency distribution of prior responses including the recipient’s own response, and a list of previously submitted comments, for each grouping. On the second questionnaire, panelists’ responses to most questions converged substantially; panelists changed their responses compared to the first questionnaire on more than 25% of the questions, and there was a significant decline ( $p<0.05$ ) in blank or “don’t know” responses. We identified ACSC based on the mean response and range of responses for each grouping.

We recruited an additional 13 senior hospital and community-based physicians and surgeons to participate on a modified Delphi panel. Each panelist received a description of the study, a definition of ACSC, and a list of likely ACSC. The panelists then met to discuss the study and the proposed lists of hospitalizations. Following this meeting, they received a modified questionnaire based on the first meeting. We calculated the mean response and distribution of responses to each question and accordingly revised the list of likely ACSC. We returned this list to panelists along with a list of comments from the questionnaires. At a second meeting, the panelists discussed these lists and reached near unanimous decisions on the classification of groupings as ACSC.

Participation on the Delphi and modified Delphi panels was 100%. We combined the lists of ACSC identified by the Delphi and modified Delphi panels, and distributed this list to both panels. Of 26 panelists, 7 (27%) returned comments.

After consultation with physician leaders practicing in rural or isolated Ontario communities, we recruited 12 well-respected physicians working in isolated communities to participate in a questionnaire-based study. These physicians received a description of the study, a copy of the questionnaire, and a stamped, addressed return envelope. We replaced non-respondents with physicians identified in the same fashion. Groupings of diagnoses and procedures were classified as ACSC according to the same criteria used in the Delphi panel process. Of 15 physicians sent questionnaires, 11 returned completed and usable questionnaires (73%).

Table I compares the composition of the three panels in this study to previous panel-based definitions of ACSC.<sup>2,3</sup>

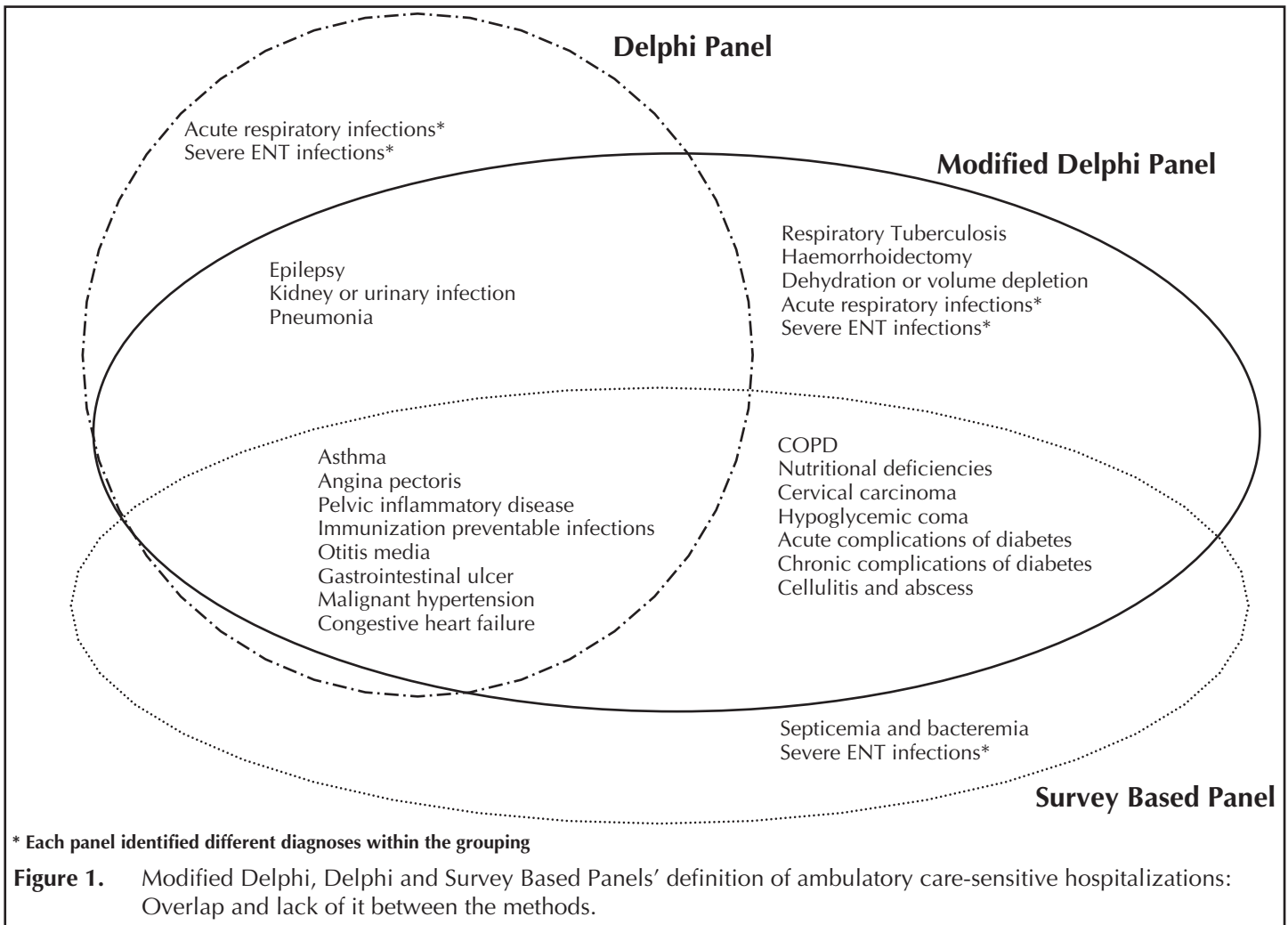
**RESULTS**

Of the 51 clinical groupings on the first questionnaire, the Delphi panel selected 13 as ACSC, the modified Delphi panel selected 23, and the Survey panel selected 17 (see Appendix for ICD-9 codes). Figure 1 shows that all 3 panels identified 8 groupings as ACSC. The Delphi and modified Delphi panels identified 3 other ACSC, and the modified Delphi and questionnaire-based panels identified 7

other ACSC. Only the modified Delphi panel selected a surgical grouping as an ACSC (haemorrhoidectomy).

Virtually all ACSC selected by the modified Delphi panel included a smaller and more specific range of diagnoses than those selected by the other two panels. On both the modified Delphi and Delphi panels, family physicians and general practitioners were more likely to support smaller groupings as ACSC. Primary care physicians also identified fewer groupings as ACSC. For example, specialist physicians and surgeons on the Delphi panel would have identified 23 groupings as ACSC; primary care physicians would have identified 8 groupings because of significantly ( $p<0.002$ ) higher mean ratings for the direct relationship between access to inpatient care and the risk of admission for an ACSC. Primary care physicians on the modified Delphi panel noted a larger number of caveats on the use of ACSC. Although the questionnaire-based panel was composed entirely of primary care physicians, they consistently rated access to in-hospital care as having little impact on the risk of admission for an ACSC, perhaps because of greater travel distances for hospital care and relative scarcity of inpatient care facilities in isolated communities.

ACSC identified by the panels overlapped strongly with previous lists of ACSC developed using similar methods in New York City and Boston,<sup>2,3</sup> as well as with lists of ACSC used in other recent studies of outcomes of poor access to care.<sup>5,6</sup> Some notable exceptions include



ruptured appendix, gastroenteritis, convulsions, and congenital syphilis. US panels have identified ruptured appendix as an ACSC, but the Canadian panels classified hospitalizations for ruptured appendix along with appendicitis, as insensitive to access to care. The Canadian panels reported hospitalizations for gastroenteritis and convulsions were related to access to both inpatient care and ambulatory care. Congenital syphilis was too rare in Ontario for analysis. In contrast, ACSC showed little overlap with discretionary hospitalizations as defined by Wennberg and coworkers.<sup>7,8</sup>

ACSC are distinct from inappropriate or avoidable hospitalizations. Gloor, Lissin, and Joubert provided a dataset of physician ratings of the appropriateness of pediatric hospitalization at one Ontario hospital.<sup>9</sup> ACSC as defined by any panel were less likely to be considered inappropriate than

all other causes of hospitalization ( $\chi^2$ :  $p < 0.073$ ).

**DISCUSSION**

Despite differences in methodology and specialty mix, the three panels proved to be feasible ways of identifying a core group of 8 ACSC. Moreover, these 8 ACSC appear in most other studies defining ACSC from outside of Canada. As in past studies using consensus methods,<sup>10-12</sup> panels with different compositions (hospital and community-based physicians, rural vs. urban practice location), using different methods (Delphi, modified Delphi, and questionnaire), and working in different regions produced different lists of ACSC. With consistent methodology, the overlap between the different panels may have been higher, although a post-study mailing to the Delphi and modified Delphi panelists did

not result in any changes. The larger number of conditions identified by the modified Delphi panel may have resulted from the opportunity for panelists to meet and resolve differences.

The core group of ACSC is well supported by the literature from the US, and to a lesser extent, from Canada and the UK. A number of studies describe an inverse relationship between good access to ambulatory care and admission rates for ACSC as a group,<sup>2,3,6,13-15</sup> and for individual ACSC such as complications of diabetes,<sup>16-20</sup> asthma, hypertension, diabetes, and pelvic inflammatory disease.<sup>21-25</sup> A smaller number of studies support a similar relationship between ACSC identified by at least two of the panels, such as severe ear, nose, and throat infections, pneumonia, and cellulitis.<sup>25-28</sup>

ACSC may be used to compare health system performance, to evaluate the effects

of health-care policies, and as part of primary care audit. Because ACSC represent a negative, albeit intermediate, health outcome, they may be used in conjunction with small area variations analysis to explore equity of health care access across communities. However, like most measures of health system performance based on routinely collected data, ACSC are best conceived of as screening tests with imperfect sensitivity (true positive rate) and imperfect specificity (true negative rate). High rates of ACSC in a community or a practice indicate the need for in-depth follow-up, they do not necessarily signal the need for immediate change in practice patterns or resource allocation. If clinicians and researchers prefer a test with greater sensitivity (i.e., a greater chance of identifying any problem with access to care), they may use ACSC identified by any panel. If they prefer a test with greater specificity (i.e., a lower probability of identifying apparent but not actual problems with access), they may use the 8 ACSC identified by all the panels.

Researchers and clinicians should be careful with the methods they use to standardize or risk-adjust rates of ACSC.<sup>29</sup> If patients with poor access to health care are also likely to be in poorer health, then risk-adjustment strategies based on comorbid diagnoses may be misleading and may artificially reduce differences in rates of ACSC across communities. Similarly, if the likelihood of developing comorbid conditions other than ACSC is also inversely related to access to ambulatory care, then risk adjustment for comorbid conditions may also artificially reduce differences across communities. Finally, researchers should be cautious of adjustment strategies that depend on socio-economic status (SES). Low SES may increase ACSC rates in a community for two reasons: because of the strong general relationship between SES and health status, and/or the strong relationship between SES and the ability to enter and navigate the health system. Thus, risk-adjustment strategies that use SES may under-represent problems with access by removing an important determinant of access.

Future research should focus on linking characteristics of good ambulatory care to

<b>Appendix</b>	
<b>Ambulatory Care-Sensitive Conditions Defined Using Different Methods</b>	
<i>International Classification of Diseases, 9th Revision (ICD-9) Codes in parentheses</i>	
Ambulatory care-sensitive conditions (ACSC) identified by all panels Asthma (493); Angina pectoris (413); Congestive heart failure (428); Gastrointestinal ulcer (531, 532, 533, 534); Immunization preventable infections (032, 033, 037, 055, or 072); Malignant hypertension (401.0, 402.0, 403.0, or 404.0); Otitis media (382); Pelvic inflammatory disease (614 or 615)	
ACSC identified by the Modified Delphi panel Asthma (493); Angina pectoris (413); Congestive heart failure (428); Cellulitis and abscess (681, 682.3, 682.4, 682.5, 682.6, 682.7, or 686); Cervical cancer (180 with procedure codes for total or radical hysterectomy); Chronic obstructive pulmonary disease (491, 492, 494, or 490 with accompanying diagnosis of 491, 492, 494, or 496 with accompanying diagnosis of 490, 491, 492, 494); Dehydration or volume depletion (276.5); Acute complications of diabetes (250.1 or 250.2); Chronic complications of diabetes (250.3 or 250.4); Severe ENT infections (382, 532, 533, or 534); Epilepsy (345.2 or 345.3); Gastrointestinal ulcer (531, 532, 533, or 534); Haemorrhoidectomy; Immunization preventable infections (032, 033, 037, 055, or 072); Kidney or urinary tract infection (590, 598.0, or 599.0); Malignant hypertension (401.0, 402.0, 403.0, or 404.0); Pelvic inflammatory disease (614 or 615)	
ACSC identified by the Delphi panel Asthma (493); Angina pectoris (413); Congestive heart failure (428 or 402 with an accompanying diagnosis of 428); Severe ENT infections (382, 462, 463, 464, or 465); Epilepsy (345); Gastrointestinal ulcer (531, 532, 533, or 534); Hypoglycaemic coma (251); Immunization preventable infections (032, 033, 037, 045, 055, 056, or 072); Kidney or urinary tract infection (590, 595, 597, 598.0, or 599.0); Malignant hypertension (401.0, 402.0, 403.0, or 404.0); Pelvic inflammatory disease (614 or 615); Pneumonia (481, 482, 483, 485, or 486); Respiratory infections (461 or 475)	
ACSC identified by the Survey panel Asthma (493); Angina pectoris (413); Congestive heart failure (428 or 402 with an accompanying diagnosis of 428); Cellulitis and abscess (681, 682, or 686); Cervical cancer (180 with procedure codes for total or radical hysterectomy); Chronic obstructive pulmonary disease (466, 491, 492, 494, or 490 with accompanying diagnosis of 491, 492, 494, or 496 with accompanying diagnosis of 490, 491, 492, 494); Acute complications of diabetes (250.1 or 250.2); Chronic complications of diabetes (250.3, 250.4, 250.5, 250.6, 250.7, or 250.9); Severe ENT infections (382, 461, 462, 463, 464, 465, or 475); Gastrointestinal ulcer (531, 532, 533, or 534); Immunization preventable infections (032, 033, 037, 045, 055, 056, or 072); Malignant hypertension (401.0, 402.0, 403.0, or 404.0); Nutritional deficiencies (260, 261, 262, 265, 266, 280, or 281); Pelvic inflammatory disease (614 or 615); Septicemia and Bacteremia (038 or 790.7)	

more specific definitions of ACSC as a way to pinpoint specific problems in access, including: 1) the provision of poor ambulatory care; 2) poor patient compliance with therapy; 3) patient delay in seeking care; 4) unobserved disease progression; and 5) delay in appropriate treatment following identification of a disease state.<sup>30</sup> This sort of linkage will also help to distinguish further preventable hospitalizations such as ACSC from avoidable admissions or inappropriate admission of a patient who only requires outpatient management. Other efforts to widen the scope of ACSC may include the development of ACSC specific to the elderly or the disabled as complements to the measurement of quality of care.

This Canadian study, using 3 different consensus methods, identified a core group of 8 ACSC. Given the overlap in results from these different study methods in Canada and the end results from Canada and other jurisdictions, it is likely that

these 8 ACSC represent a reasonable method for measuring access to care and a valuable tool for rapid assessment of health systems.

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