

HEALTH SERVICES

The role of primary care in preventing ambulatory care sensitive conditions

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Background: To examine the postulated relationship between Ambulatory Care Sensitive Conditions (ACSC) and Primary Health Care (PHC) in the US context for the European context, in order to develop an ACSC list as markers of PHC effectiveness and to specify which PHC activities are primarily responsible for reducing hospitalization rates. **Methods:** To apply the criteria proposed by Solberg and Weissman to obtain a list of codes of ACSC and to consider the PHC intervention according to a panel of experts. **Five selection criteria:** i) existence of prior studies; ii) hospitalization rate at least 1/10,000 or 'risky health problem'; iii) clarity in definition and coding; iv) potentially avoidable hospitalization through PHC; v) hospitalization necessary when health problem occurs. **Fulfilment of all criteria was required for developing the final ACSC list.** A sample of 248,050 discharges corresponding to 2,248,976 inhabitants of Catalonia in 1996 provided hospitalization rate data. A Delphi survey was performed with a group of 44 experts reviewing 113 ICD diagnostic codes (International Classification of Diseases, 9th Revision, Clinical Modification), previously considered to be ACSC. **Results:** The five criteria selected 61 ICD as a core list of ACSC codes and 90 ICD for an expanded list. **Conclusions:** A core list of ACSC as markers of PHC effectiveness identifies health conditions amenable to specific aspects of PHC and minimizes the limitations attributable to variations in hospital admission policies. An expanded list should be useful to evaluate global PHC performance and to analyse market responsibility for ACSC by PHC and Specialist Care.

Keywords: ambulatory care sensitive conditions (ACSC), Delphi technique, preventable hospitalizations, primary health care, trans-cultural adaptation

Timely and effective Primary Health Care (PHC) could reduce the risk of hospitalizations due to Ambulatory Care Sensitive Conditions (ACSC) although the magnitude of the effect differs according to specific clinical conditions.¹ The more removed from the intended purpose, the more likely the limitations. For example, admission rates may depend, at least in part, on hospital admission policies as well as on PHC effectiveness. Recent publications have emphasized the need to review carefully the choice of specific indicator when intended as a measure of performance of PHC.²

Variability in ACSC lists and in factors associated with hospitalization rates^{3–7} raises questions as to the extent to which hospitalizations are actually preventable by PHC, especially under circumstances when hospital staff make the decision on the need for hospitalization and there is variability in admission criteria within and between hospitals.^{8–10} Also relevant is the consideration of which specific PHC activities influence each of the selected health conditions.

Therefore, the selection of diagnoses to be considered as ACSC represents one of the most relevant parts of the methodology of these studies. Optimally, the list should be adapted to the context of each study to guarantee the validity, reliability and magnitude

of the hospitalization rates; particularly when health systems are different: US context where the indicator had its origin (individual health insurance and restricted public funding) and European context (publicly funded and universal coverage in most countries).^{11,12} As part of the adaptation process for these lists, authors such as Solberg¹³ and Weissman¹⁴ developed criteria for considering appropriateness of diagnoses. The criteria proposed by these authors combine consensus criteria with objective criteria, which reduces the limitations¹⁵ inherent in the consensus methodology used by other authors.^{16,17}

The goal of this paper is to determine whether the theoretical relationship between ACSC and PHC is as useful in the European context (for Spanish general practitioners) as it appears to be in the US context.^{18–20} It is achieved considering both the conceptual basis for relating a condition to the activities of PHC and for specifying which aspect of this level of care would be primarily responsible for reducing hospitalization rates.

METHODS

We first applied the criteria proposed by Solberg¹³ and Weissman¹⁴ to obtain a list of codes. Second, we considered the PHC intervention most related to prevention of hospitalization according to a panel of experts. This Delphi survey was carried out between July 1998 and December 1998.

Criteria developed for considering appropriateness of diagnoses were: i) existence of prior studies; ii) hospitalization rate of at least 1/10,000 or a 'risky health problem' (an important health problem or a condition with a burden of co-morbidity worsening the prognosis); iii) clarity in the definition and coding of diagnoses; iv) hospitalization potentially avoidable through PHC, considering age, gender and type of care; and v) hospitalization necessary when the health problem occurs.

The first part of this study developed the procedure to select ICD codes for ACSC lists. This process involved three steps: the gathering of information from the literature, judgements concerning the suitability of each of the codes previously used, and the final selection.

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The information related to each criterion was collected from the following sources:

- An extensive bibliographical search (Criterion 1).
- A pilot study on hospitalization rates using a sample of 248,050 discharges corresponding to 2,248,976 inhabitants of Catalonia²¹ (Criterion 2).

Hospitalizations rates were derived from the Data Base Set of hospital discharges obtained from the Catalan Health Service, 1996. This data base included all discharges from all public hospitals belonging to the public utilization hospital network of Catalonia; completeness of the reporting form was 97,5%.²²

- Judgement by experts of the characteristics of each ICD code regarding its relevance for PHC, using a Delphi technique (Criteria 3, 4, and 5).

The bibliographic search identified the existence of ACSC lists on studies published before 1998. A total of 16 papers was obtained from Medline searching by 'ACSC' and/or 'preventable or avoidable hospitalization' (Criterion 1; table 1).^{1,3-5,13,14,18-20,23-29} The pilot study determined the codes with a hospitalization rate of at least 1/10,000 (Criterion 2, data on hospitalization rates are available from the author on request). To establish the fulfilment of clarity in the definition and coding of diagnoses (Criterion 3), three of the co-authors and six experts (co-ordinating team) considered the extent to which the code

was sufficiently clear and homogeneous to serve as the basis for making a judgement of suitability as an ACSC condition. Experts for the co-ordinating team were selected from among previous ACSC researchers and experts on consensus methodology. A consensus procedure, the Delphi technique, was used to ascertain the judgement of health professionals concerning the role of PHC as being responsible for avoiding hospitalization (criterion 4) and the need for hospitalization when the condition occurs (criterion 5).

Expert opinions were gathered through an anonymous survey containing two questions as follows:

Question A. Is there a role* for PHC in avoiding hospitalization for the following conditions? Yes/No role for PHC in avoiding hospitalization [* Having a role means applying one or more of the following interventions: 1) primary prevention; 2) early diagnoses (and treatment) of the condition or its precursor; 3) good ongoing control and management; or 4) other (please specify)].

Question B. Is hospitalization necessary when the condition occurs? Yes/No.

The definitive level of consensus for both questions was established when at least 75% of participants agreed on each question, considering the level of questionnaire completion at 85% of total items submitted.

Table 1 Process to select the ACSC core list

Codes fulfilling all five criteria		Codes failing any criteria			
Generic diagnosis	ICD-9-CM codes	ICD-9-CM codes	Criteria 2	Criteria 3	Criteria 5
Immunization and preventable infectious diseases ^{4,14,19,20,23,24,27,29}	032; 037; 045; 320.0; 390; 391	033	X		X
		055	X		X
		056	X		X
		072	X		X
Congenital syphilis ^{4,20,29}	090	-			
Tuberculosis ^{4,20,25,27}	012-018	011			X
Diabetes mellitus ^{3,4,14,18-20,23-29}	250.1; 250.2; 250.3; 251.0; 785.4+250.7	250.0			X
		250.7			X
		250.8			X
		250.9		X	X
		251.2		X	X
Nutritional deficiencies ^{4,20,27}		260	X		
		261	X		
		262	X		
		268.0	X		No consensus
		268.1	X		X
Disorders of hydro-electrolyte metabolism ^{4,14,19,20,23,27,29}	276.5; 276.8	-			
Iron-deficiency anemia ^{4,20,27}	280				X
Convulsions ^{4,20,24,27,29}		345			X
		780.3			X
Diseases of the upper respiratory tract ^{4,20,25-29}	475	382			X
		461	X		X
		462	X		X
		463			X
		465			X
		472.1	X		X
Hypertensive heart disease ^{3,4,14,18-20,23-29}	401; 403; 404; 405; 410-414; 430; 431; 436; 437.2	401.9		X	X
		402.00			No consensus
		402.10			X
		402.90	X	X	X
Heart failure ^{3,4,14,18-20,23-25,27-29}	402.01; 402.11; 402.91; 518.4	428			No consensus

The number of experts in the consensus phase was determined as the minimum necessary to guarantee that at least 20 would complete all possible rounds,¹⁶ taking into account the potential losses in the Spanish healthcare context, which are said to be as high as 50%.³⁰ A mixed panel³¹ of 44 experts was selected at random from the 88 participants proposed by the co-ordinating team. Most of the experts were physicians, approximately half of them were from PHC; the others were managers, specialists, and health services researchers, working in both rural and urban areas. Divergence of opinions due to different professional contexts³² was examined by means of a Kappa test. Eventually, after obtaining information for the fulfilment of each criterion, a process of selection was executed by screening each ICD code with the five criteria to achieve final lists. The second part of this survey considered expert judgement of the relationship between PHC and ACSC in the Spanish context.

RESULTS

The literature review (Criterion 1)

All 113 ICD codes obtained from the literature were submitted to the experts for their judgements (table 1). All experts were

kept on through the three rounds before reaching consensus. Completion of the questionnaire reached the level established (85%), so no expert was excluded. Missing answers for particular ICD codes were occasionally observed (maximum missing answers for question A = 5 cases, and for question B = 9 cases of a total of 113 items). The Kappa test showed levels between 0.57 and 0.80 (good to excellent, according to Landis and Kock's scale³³), indicating good agreement across professional contexts of the experts.

Meeting criteria 2-5

■ **Criterion 2**

Twenty codes did not meet the criterion of hospitalization rate of at least 1/10,000 inhabitants or considered as a 'risky health problem' (table 1).

■ **Criterion 3**

Five codes were not considered to have clarity in definition and coding (table 1).

■ **Criterion 4**

All 113 ICD codes were considered amenable to PHC intervention (table 1). Consensus was reached for all groups of diagnostic codes, with values between 79.5 and 100%. In the first

Table 1 continued Process to select the ACSC core list

Codes fulfilling all five criteria		Codes failing any criteria			
Generic diagnosis	ICD-9-CM codes	ICD-9-CM codes	Criteria 2	Criteria 3	Criteria 5
Pneumonia ^{3,4,14,19,20,23-29}	482.2; 482.3; 483; 485; 486	481 482.9			X No consensus
Bronchitis / Chronic obstructive pulmonary disease ^{4,18,20,23,24,26-29}		466.0 491 496 490 492 494 493			X X X X X X
Asthma ^{3,4,14,18-20,23-25,27-29}		493			X
Bleeding or perforating ulcer ^{14,19,23}	531.0; 531.2; 531.4; 531.6; 532.0; 532.2; 532.4; 532.6; 533.0; 533.2; 533.4; 533.6	-			
Appendicitis with complication ^{14,19,23,28}	540.0; 540.1	-			
Dental conditions ^{4,20,27,29}	-	521 522 523 525 528	X X X X X		X X X X X
Disease of the skin and subcutaneous tissue ^{4,14,19,20,23,25-29}	-	681 682 683 686			X X X X
Gastroenteritis ^{4,20,25,27,29}	-	558.9			X
Urinary tract infections ^{4,14,19,20,23-25,27,29}	590.1	590.0 590.8 599.0 599.9			X No consensus X
Pelvic inflammatory disease ^{4,20,27}	614	-	X	X	X
Growth deficiencies ^{4,20}		783.4	X		X

Criterion 1 = Existence of prior studies. References of authors reviewed as super-index (no code was excluded).
 Criterion 2 = Hospitalization rate at least 1/10,000 or 'Risky health problem' (an important health problem or a condition with a burden of co-morbidity worsening the prognosis).
 Criterion 3 = Clarity in the definition and coding of diagnoses.
 Criterion 4 = Hospitalization potentially avoidable through PHC (no code was excluded).
 Criterion 5 = Hospitalization necessary when the health problem occurs.
 X = Criterion not met.

round, 95 ICD codes (84.1%) reached consensus, of which 35 reached the highest level (100%) (data for individual codes available on request).

■ Criterion 5

After the Delphi survey, consensus was reached for 108 codes: 63 of these were considered as 'hospitalization needed' and 45 as 'hospitalization not needed'. The remaining five (ICD codes 268.0; 402.00; 428; 482.9; and, 590.8) did not reach the minimum level of required consensus. Of those that reached the required consensus, consensus values varied between 75% and 100% for either possibility ('hospitalization is necessary' or 'hospitalization is not necessary').

Final selection was carried out by the co-ordinating team, which reviewed each selected code against the five selection criteria. There were no cases excluded on the basis of Criteria 1 and 4 (table 1). Those codes only failing to meet the criterion 'hospitalization needed' were subjected to a second reconsideration concerning the fulfilment of criterion 1 (prior studies) when the ICD code was referred by at least 90% of the authors and, in addition, taking into consideration a high consensus reached for the rest of the ICD codes included in the diagnostic group. Codes 402.00, 428, 482.9 and 590.8 were re-captured by this final scrutiny.

In the same way, the definition of hypertensive heart disease was reviewed. Two groups of diagnostic codes, ICD 410–414 +[401–405] (acute myocardial infarction + hypertension) and ICD 430; 431; 437.2 +[401–405] (cerebral infarction + hypertension), were conditioned on the presence of hypertension as a secondary diagnosis. Almost all reviewed studies (14 out of 16) included cardiovascular diseases without an additional condition. The code set was resolved by the decision to include ICD 410–414 (ischemic heart disease) and ICD 430; 431; 436; 437.2 (cerebrovascular disease).

Two separate code lists resulted. Fulfilment of all five criteria was required for eventual inclusion of each diagnosis in a study of PHC effectiveness (Core ACSC list; 61 ICD codes [table 2]). Those codes excluded only by criteria 5 (hospitalization needed) were also considered sensitive to PHC services (Expanded ACSC list; 90 ICD codes [table 2]). Codes not fulfilling criterion 2 or 3,

or a combination of more than one criterion (criterion 2, 3 and/or 5) were excluded (table 3).

Experts' opinions on which aspect of PHCs was responsible for reducing ACSC hospitalizations

The 61 ICD diagnosis codes in which hospitalization was considered needed were subjected to final judgements for the specific role played by PHC. Most health problems or conditions, either chronic or acute, were considered to be sensitive to more than one type of PHC intervention. However, in some cases a single priority intervention was identified (e.g. primary prevention for infectious diseases preventable by immunisation). For other conditions, the opinion of experts showed the importance of multimodal interventions in the delivery of care (e.g. good ongoing control and early diagnosis and treatment for diabetes) (table 4). Experts did not identify primary prevention for the hypertensive heart diseases due to the initial particular definition we used. Consensus was derived when hypertension was included as a secondary diagnosis, but this condition was removed in developing the final list. The reason for this change

Table 3 Excluded ACSC codes

Group of diagnosis codes	ICD-9-CM codes
Immunization and preventable infectious diseases	033, 055, 056, 072
Diabetes mellitus	250.9, 251.2
Nutritional deficiencies	260, 261, 262, 268.0, 268.1
Diseases of the upper respiratory tract	461, 462, 472.1
Hypertensive heart disease	401.9, 402.90
Dental conditions	521, 522, 523, 525, 528
Urinary tract infections	599.9
Growth deficiencies	783.4

Table 2 Core ACSC list^a (italic codes) and expanded ACSC list^b

Group of diagnosis codes	ICD-9-CM codes	Group of diagnosis codes	ICD-9-CM codes
Immunization and preventable infectious diseases	032, 037, 045, 320.0, 390, 391	Pneumonia	481, 482.2, 482.3, 482.9, 483, 485, 486
Congenital syphilis	090	Bronchitis / Chronic obstructive pulmonary disease (COAD)	466.0, 490, 491, 492, 494, 496
Tuberculosis	011, 012–018	Asthma	493
Diabetes mellitus	250.0, 250.1, 250.2, 250.3, 250.7, 250.8, 251.0, 785.4+250.7	Bleeding or perforating ulcer	531.0, 531.2, 531.4, 531.6, 532.0, 532.2, 532.4, 532.6, 533.0, 533.2, 533.4, 533.6
Disorders of hydro-electrolyte metabolism	276.5, 276.8	Appendicitis with complication	540.0, 540.1
Iron-deficiency anemia	280	Disease of the skin and subcutaneous tissue	681, 682, 683, 686
Convulsions	345, 780.3	Gastroenteritis	558.9
Diseases of the upper respiratory tract	382, 463, 465, 475	Urinary tract infections	590.0, 590.1, 599.0, 590.8
Hypertensive heart disease	401, 402.00, 402.10, 403–405, 410–414, 430, 431, 436, 437.2	Pelvic inflammatory disease	614
Heart failure	428, 402.01, 402.11, 402.91, 518.4		

a: Core ACSC list: To assess effectiveness and quality of PHC.

b: Expanded ACSC list: To assess global PHC performance and marked responsibility for ACSC amongst PHC and Specialist Care.

is that most prior authors did not require it, and because of evidence of the benefit of primary prevention for hypertension as well as other related risk factors. Moreover, the hospitalization rate of this ACSC group increased by 40% when hypertensive heart diseases were considered without an additional condition.

DISCUSSION

The criteria proposed by Solberg¹³ and Weissman¹⁴ proved very useful in this study to identify a core set of ACSC codes. All initial diagnostic codes obtained from the literature were considered conditions for which evidence exists that specific PHC modalities reduce hospitalization rates. However, for many codes, non-fulfilment of the criterion of the need for hospitalization was considered as a main confounding determinant by different authors.^{2,8-10} In the case of comparing small areas dependent on different hospitals or for assessing PHC quality, the use of the *core ACSC list* is proposed. This core list reduces significantly the limitations that stem from hospital admission criteria due to patient clinical characteristics, variation in hospital medical practice and hospital admission policies. In contrast, the *expanded ACSC list* should be useful to evaluate global PHC performance or to analyse market responsibility for ACSC among PHC and Specialist Care.²¹

This study added to the literature considering which aspects of PHC were responsible for preventing hospitalization. These included primary prevention (protection of health by personal and community-wide effects by means of interventions addressed to prevent the condition from occurring, for example immunizing against infectious diseases, physical fitness, etc.), early detection and monitoring of acute episodes, and follow-up and monitoring of chronic conditions. However, a single most important intervention for some of health problems could not always be identified, consistent with the notion that clinical interventions often have multiple impacts, as in the case of diabetes or cardiovascular diseases. One possible limitation to the study was the multiple options allowed to the experts for amenability to PHC. This slightly diluted the information obtained and limited identification of the priority intervention. In most chronic health problems with no unique causal factor known, medical interventions should be aimed at reducing or avoiding known trigger or associated factors: early detection of symptoms related to the onset of disease, appropriate treatment once the disease is diagnosed, and adequate monitoring to avoid or delay, whenever possible, the occurrence of acute and chronic complications (*table 4*). Furthermore, it is apparent from the experts' comments that the need for hospitalization is very dependent on other factors, such as age and co-morbidity, in

particular for conditions such as COPD.³⁴ So hospitalization rates due to ACSC in elderly needs to be controlled by co-morbidities.

The use of each proposed indicator can be a measure of PHC's capability to solve health problems, although the expected effect on potentially avoidable hospitalizations will differ depending on the conditions being treated. Hospitalizations should be essentially eliminated for infectious diseases amenable to primary prevention through immunization (e.g. diphtheria). Or for those that can be prevented either by early diagnosis and treatment of the disease precursor (e.g. rheumatic fever) or at the early stages of the natural course of the disease (e.g. pelvic inflammatory disease); except for populations deprived of medical care (such as recent immigrants from poor countries). On the other hand, for non-infectious diseases the most immediate result should be decline of the occurrence of acute complications (e.g. coma in diabetic patients) and the reduction in hospital re-admissions and their length of stay (e.g. in heart failure).

Little is known about the frequency of hospitalizations for ACSC in different countries, in particular for Europe. Differences in the relative frequency of the different conditions might be evidence of differences in coding or diagnostic practices, in the absence of other plausible reasons. Moreover, the extent to which differences in overall rates of ACSC hospitalizations is associated with differences in the strength of the PHC systems in the different countries³⁵ appears to be worth exploring, since these hospitalizations have been considered a sensitive marker for the quality of PHC received.

In conclusion, the fulfilment of criteria defining the internal validity of ACSC provides a group of ACSC as markers of PHC effectiveness because they establish health conditions amenable to PHC while minimizing hospital confounder factors. This study has also demonstrated the value of a systematic approach to identifying conditions that are amenable to particular types of PHC interventions to reduce hospitalizations. The methodology would appear to be adequate for trans-cultural adaptation.

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Table 4 Role of PHC in preventing ACSC hospitalizations core ACSC list

Type of intervention	Infectious diseases	Non infectious diseases
1 Primary prevention	Infectious diseases susceptible to prevention through immunization	Hypertensive heart disease
2 Early diagnosis and treatment	Rheumatic fever Congenital syphilis Other tuberculosis Peritonsillar abscess Pneumonia Appendicitis with complications Acute pyelonephritis Pelvic inflammatory disease	Diabetes mellitus Disorders of hydro-electrolyte metabolism Hypertensive heart disease Heart failure Bleeding or perforating ulcer
3 Good ongoing, control and management		Diabetes mellitus Hypertensive heart disease Heart failure Bleeding or perforating ulcer

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