Which hospitalisations are ambulatory care-sensitive, to what degree, and how could the rates be reduced? Results of a group consensus study in Germany

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ABSTRACT

Background: Much has been written lately regarding hospitalisations for ambulatory care-sensitive conditions (ACSH) and their strengths and weaknesses as a quality management indicator. The idea underlying ambulatory care-sensitive conditions (ACSC) is that effective treatment of acute conditions, good management of chronic illnesses and immunisation against infectious diseases can reduce the risk of a specified set of hospitalisations.
Methods: The present paper applies group consensus methods to synthesise available evidence with expert opinion, thus identifying relevant ACSC. It contributes to the literature by evaluating the degree of preventability of ACSH and surveying the medical and systemic changes needed to increase quality for each diagnosis group. Forty physicians proportionally selected from all medical disciplines relevant to the treatment of ACSC participated in the three round Delphi survey. The setting of the study is Germany.
Results: The proposed core list is a subset of 22 ACSC diagnosis groups, covering 90% of all consented ACSH and conditions with a higher than 85% estimated degree of preventability. Of all 18.6 million German hospital cases in the year 2012, the panelists considered 5.04 million hospitalisations (27%) to be sensitive to ambulatory care, of which 3.72 (20%) were estimated to be actually preventable. If only emergencies are considered, the ACSH share reduces to less than 8%. The geographic distribution of ACSH indicates significant regional variation with particularly high rates and potential for improvement in the North Rhine region, in Thuringia, Saxony-Anhalt, northern and eastern Bavaria and the Saarland.

The average degree of preventability was 75% across all diagnosis groups. By far the most often mentioned strategy for reducing ACSH was 'improving continuous care'.
Conclusion: There are several good reasons why process indicators prevail in the assessment of ambulatory care. ACSH rates can however provide a more complete picture by adding useful information related to the overall patient outcome. The results of our analysis should be used to encourage debate and as a basis for further confirmatory work.

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1. Introduction

In many European countries, providers of ambulatory care are the first point of contact for patients. Ambulatory care is thus a cornerstone of health care and measurement of its quality can help to ensure that the system

works effectively for the benefit of the patient [1]. However, ambulatory care outcomes are often difficult to assess because many patients suffer from chronic illnesses without distinct endpoints and it is not uncommon for patients to utilise several providers simultaneously [2]. Hard outcomes such as mortality may in some cases be attributable to ambulatory care but often occur long after the treatment has been given. Quality improvement schemes in developed health care systems therefore tend to rely on intermediate indicators of quality such as lowering blood pressure or immunisation rates. A sole focus on processes can however mean that a more holistic and outcome-oriented view of the patient's health status is neglected. For this reason, researchers in the USA began in the 1990s to consider potentially avoidable hospitalisations as a possible solution. The concept of ambulatory care-sensitive conditions (ACSC) was introduced to describe those conditions for which a large proportion of hospitalisations could be avoided given timely and effective ambulatory care.

A number of recent reviews have discussed the strengths and limitations of ACSC hospitalisations as a quality management indicator (for an overview see [3–5]). The concept rests on the assumption that hospitalisation rates can be reduced by effective ambulatory treatment of acute conditions, by effective management of chronic illnesses and by immunisation against infectious diseases. Increased hospitalisation rates for ACSC may thus be indicative of deficits in ambulatory care [6].

The question of which hospitalisations are sensitive to effective and timely ambulatory care depends to a large extent on context. For example, the boundaries of the ambulatory care sector,[1] relevant public health problems (e.g. infectious diseases prevail in Brazil [7]), physician training, difference in practice norms, the quality of disease coding and the (technological) progress of medicine may all influence the designation of a condition as ambulatory care-sensitive [8]. While several context-specific ACSC lists do exist, it is often unclear how the lists were compiled and why some hospitalisations are considered ambulatory care-sensitive and others not. This may weaken both the acceptance and validity of the measure [9].

The relationship between effective ambulatory care and hospitalisations for ambulatory care sensitive conditions (ACSH) is moreover confounded by a number of exogenous factors, for example, patient demographics [10–14], disease burden [14–16], behavioural risk [15] and socioeconomic factors [2,5,10,14,16–18], the structure of the hospital sector [2,19] and patient preferences regarding use of care [15] and compliance [20]. Against this background, it would seem appropriate to pay careful attention to the reliability of the ACSH approach for quality monitoring purposes.

In order to encourage the acceptance of ACSH indicators and provide a measure of their reliability, reproducible methods are needed to assess the level of agreement for ACSC among physicians. In particular, it is necessary to analyse the degree to which ACSH are preventable in the presence of potentially strong confounders and to provide a systematic discussion of strategies to reduce ACSH. Based on previous research [6,18,21], the present paper therefore applies group consensus methods which synthesise the available evidence with expert opinion in order to identify relevant ACSC. It contributes to the literature by evaluating the degree of preventability of ACSH and surveys for each diagnosis group the medical and systemic changes needed to increase quality. The setting of the study is Germany.

2. Methods

Relevant ACSC were selected using five criteria developed by Caminal et al. [21], Solberg et al. [22] and Weissman et al. [6] and supported by an empirical study of regional variation in German hospitalisation rates. The criteria are (i) evidence in the literature that the condition is ambulatory care-sensitive; (ii) the relevance of the diagnosis for public health; (iii) consensus among experts and clinicians that the hospitalisation is potentially avoidable by the effective and timely provision of ambulatory care; (iv) clarity regarding the definition and coding of the diagnosis and (v) the necessity of hospital treatment should the health problem related to the condition occur [21].

Criterion (i) was met by searching Medline, EMBASE, the Cochrane collaboration and the Internet using the terms ["ambulatory care sensitive" or "ACSC" or "ACSH" or "preventable hospitalisations" or "avoidable hospitalisations"] in June 2013 with an update in September 2013. In addition, the authors manually searched the reference lists of the identified studies to ensure completeness. The conditions were specified in terms of the World Health Organisation International Classification of Diseases (ICD) [23] and ordered by the number of times they were mentioned in the literature [8]. ICD-9 codes were converted to ICD-10 codes using official mapping tables.

Solberg et al. [22] and Weissman et al. [6] suggest that a diagnosis is relevant for public health (**criterion ii**) if it has a hospitalisation rate of least 1/10,000 and/or if it represents a 'risky health problem'. Diagnosis groups with a hospitalisation rate significantly below the recommended threshold were therefore excluded from the proposed list, with the exception of infectious diseases for which effective immunisation is available.

The requirement of expert consensus that the diagnosis is potentially avoidable by timely and effective ambulatory care (**criterion iii**), the validity of the coding (**criterion iv**) and the necessity of hospitalisation (**criterion v**) were evaluated by a panel of 40 physicians using Delphi techniques between September 2013 and January 2014.

The Delphi technique is a structured interactive method involving the repeated administration of questionnaires [24]. The main stages of our Delphi study included the identification of a proposed list of ACSC, the development of the questionnaires, the selection of the panelists, three rounds of anonymous iterative online surveys and, for the first and second round, the summarisation and feedback of the results.

The number of participants and their representativeness affect both the potential for ideas and the acceptance

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[1] In Germany, about 36% of ambulatory practitioners are, for instance, general practitioners while the remaining 64% practice as medical specialists.

of the study results [25]. Forty physicians were recruited to participate in the Delphi survey. These were selected proportionally from all ACSC-relevant medical disciplines, half working in the ambulatory sector and half in hospitals, practising both in urban and in rural areas (please see Appendix II for a detailed list). All panellists had completed residency or support by a physician with completed residency during the survey.

In the **first Delphi round**, the experts were presented with a list of ACSC codes with relevance for public health (criterion ii) that had been identified during the literature search (criterion i). Additionally, a database of all German hospital cases was queried to identify further potential ACSC. A sole focus on published literature may bias expert opinion if it "anchors" [26] the participants, thus perpetuating existing ACSC lists so that new and/or context specific public health problems [27] or temporal changes in disease coding accuracy [28] are overlooked. We therefore investigated the regional variability of the 100 most often coded hospital diagnoses in 2011. Conditions were selected for further consideration if the median variance among the German states was at least 20% greater than expected. The expected median variance was estimated using quantile regression techniques employing the software SAS. High regional variation in hospitalisation rates may indicate that a condition is preventable if conceivably caused by unwarranted differences in access or medical practice. On the basis of the empirical results, a scientific committee of three experts selected 20 conditions that they regarded as potentially sensitive to ambulatory care. These were included in the condition set for the first Delphi round.

Alongside the proposed ACSC list, the participants received written information about the concept of ACSC, including the description of criteria iii–v and a definition of the boundaries of the ambulatory sector (office-based GPs and specialists together with other ambulatory providers). For each ICD-code, a personalised online survey asked the experts whether hospitalisation for the condition can be prevented by timely and effective ambulatory care [yes/no/to some extent/don't know]. Finally, both at the end of each disease chapter and at the end of the survey, the experts were invited to propose additional ACSC.

If more than 70% of experts considered a diagnosis to be ambulatory care-sensitive [yes], then the ICD-10 code was included in the set for the third round. If more than 70% answered 'no', the diagnosis was excluded from the study [29]. The remaining ICD-codes were investigated in more depth in a second round. Before conducting the Delphi survey, the questionnaire was piloted by a group of three physicians.

In preparation for the **second Delphi round**, the experts received feedback to show their answers in relation to the other experts' answers [percentages of yes/no/'to some extent' and 'don't know' in relation to own answer]. If the experts considered a 3-digit ICD-10 code to be ambulatory care-sensitive to 'some extent' in the first round, they were asked to select the appropriate 4-digit ICD-10 codes in the second round. If a diagnosis had not reached the 70% consensus level, or had been newly proposed by physicians in the first round, it was evaluated in the second round.

Before the **third Delphi round**, the experts received feedback with the results of the second round. The third questionnaire then listed all diagnoses which exceeded the 70% threshold in either the first or the second round. The participants were asked to confirm once more the appropriateness of the diagnoses. In addition, the experts evaluated the **degree of preventability** of selected ACSC and specified the **medical actions** and **systemic changes** that could lead to a reduction in hospitalisation for the conditions.

The participants were informed that, according to a number of studies, not all hospitalisations for ACSC can be prevented by effective ambulatory care. In particular, patient-level factors play an important role [10–18]. Physicians were therefore asked to estimate the percentage of hospitalisations for ACSC that can actually be prevented by an effective ambulatory care sector, considering potential exogenous factors and based on their professional experience.

Furthermore, the panelists were asked which medical action(s) [immunisation; other primary prevention; effective treatment of acute disease; early detection of disease; effective management of chronic disease] and which changes at the level of the health care system [better access to ambulatory care; reduction of medical uncertainty; improving continuous care; other financial incentives; others] could significantly reduce hospitalisations for ACSC. These categories were proposed on the basis of relevant systematic reviews and original articles and reports [3,14,30–32] describing current health programmes.

It was further explained that the category 'better access to ambulatory care' includes structural changes that lead to improved regional access to practitioners, shorter waiting times and/or longer office hours in the ambulatory sector. Additional measures such as telemedicine and extending the role of non-physician health care professionals also belong to this group.

The 'reduction of medical uncertainty' refers to the further development and implementation of medical guidelines, increased and better coordinated further medical education (especially for young medical doctors) and making it easier for patients to obtain a second medical opinion.

The category 'improving continuous care' describes all measures aimed at achieving better intra- and intersectoral coordination among ambulatory care practitioners and between ambulatory care practitioners and hospitals. This includes, for example, the introduction of the electronic health card, the further development of disease management programmes and/or improved quality management in the ambulatory sector.

'Other financial incentives' were described as alternative models of reimbursement such as fee-for-service or pay-for-performance. Currently, under the German statutory health insurance system, a quarterly standard volume of services is allocated to every licensed ambulatory physician based on his or her specialisation and number of patients. Once this quota is exhausted, additional ambulatory services are only partially reimbursed. An exception is made for specific extra-budgetary services deemed to be

Table 1
Summary of methods and key results of the three round Delphi survey.

1. Round: assessment mostly based on 3-digit ICD-codes	2. Round: detailed assessment mostly based on 4-digit ICD-codes	3. Round: validation and assessment of measures to reduce ACSH
• **Selection of proposed diagnoses** Selection of public health relevant ACSC based on literature review. Identification of 20 public health relevant diagnoses with a very high regional variation in Germany. Identification of altogether 252 (mostly 3-digit) diagnoses. • **Structured questionnaire** Presentation of detailed background information. Hierarchical organisation of ICD-codes (usually 3 digits; sometimes 4 digits). Assessment whether condition is ambulatory care sensitive [yes/no/only subcategories of ICD/don't know]. Participants were asked to propose additional ACSC. Decision rule: if >70% agree → validation in 3. round; if >70% disagree → condition was excluded; otherwise detailed assessment in 2. round. • **Key results** 95 of 252 ICD-codes received more than 70% agreement (→3. round). 14 of 252 ICD-codes received more than 70% disagreement (→excluded). 66 additional diagnoses were proposed by physicians. All 40 physicians completed round 1 and received a personalised feedback sheet with own response in relation to the distribution of all responses.	• **Selection of proposed diagnoses** Additional conditions proposed by participants if public health relevant. ICD codes that did not receive 70% agreement or disagreement were presented on a more detailed 4-digit level. Presentation of 295 (mostly 4-digit) ICD codes. • **Structure of questionnaire** Presentation of detailed background information. Assessment whether condition is ambulatory care-sensitive [yes/no/don't know]. Participants could comment in free text space. Decision rule: if > 70% agree → validation in 3. round; otherwise → condition was excluded. • **Key results** 171 of 295 ICD-codes received more than 70% agreement (→3. round) which could be extracted to 174 (3-and 4-digit) ICD-codes. 124 of 295 ICD-codes were excluded. Attrition of 3 physicians. 37 physicians completed round 2 and received a feedback sheet with own response in relation to the distribution of all responses.	• **Selection of proposed diagnoses** Merging and extracting the ICD-codes from round 1 and round 2 gave 258 generic (3- and 4-digit) ICD-codes. • **Structure of questionnaire** Presentation of detailed background information on ACSC and measures to reduce ACSH. Last validation whether condition is ambulatory care sensitive (yes/no/don't know). ICD codes were grouped in diagnosis groups. Decision rule: if >70% agree → diagnosis group was included in ACSC list. Assessment of the degree of preventability ranging on a scale from 0% to 100% broken down by diagnosis group. Assessment of medical action which can best reduce hospitalisation for ACSC broken down by diagnosis group. Evaluation of systemic changes to reduce ACSH broken down by diagnosis groups. Participants were asked to comment on/explain answers in free text space. • **Key results** All 258 codes exceeded the 70% threshold (→ included in ACSC list). Lowest approval rate was 87%. Estimated preventability ranged from 55% to 96% among all ACSH. Attrition of 2 physicians. 35 physicians completed round 3.

particularly worthwhile, such as those within the disease management programmes.

In addition to the suggested categories, physicians could propose alternative quality improvement measures in free text.

The three survey rounds thus yielded a list of ACSC, each of which having received at least 70% approval in two of the constituent rounds. A scientific committee of experts checked this final list for consistency and plausibility using the five criteria proposed by Caminal et al. [21].

Since 1998, the German Federal Statistics Office has released aggregated data on the primary diagnoses coded for all hospital patients. Using data for the year 2012, the age-standardised number of hospitalisations per 100,000 inhabitants was calculated for each ACSC in each of the 412 German districts in order to depict the geographic variation of ACSH.

3. Results

The literature search identified nine studies or reports published before 2013 that (i) explicitly applied the concept of ACSH and/or explicitly distinguished ACSC from the wider concept of avoidable hospitalisations and (ii) described the approach used to select the ACSC [6,18,21,33–38]. The number of experts involved in the compilation of existing ACSC lists ranged from 5 [6] to 44

[21]. Of the studies reporting ACSC lists without mention of the method of ACSC selection, most were based on one of these nine studies. Please see Appendix III for an overview of the ACSC lists.

In the **first Delphi round**, 252 ICD-codes were evaluated, having been identified by the literature review and the accompanying empirical study. Of these ICD-10 codes, mostly at the level of 3-digits, 95 received more than 70% approval while 14 could be excluded immediately. The panelists proposed 66 additional ICD-10 codes, including back pain, depressive disorders and gonarthrosis.

The **second Delphi round** evaluated 295 diagnoses at a more detailed level of mostly 4-digits, of which 171 codes exceeded the 70% threshold.

In the **third round**, the panelists were presented with the 258 ICD-10 codes that had been selected by the first and second rounds. The lowest approval rating in the third round was tuberculosis, with 87% approval. The 258 diagnoses were then grouped according to disease categories and experts evaluated for each group both the degree of preventability and the medical actions and systemic changes that could substantially reduce hospitalisation. Table 1 summarises the approach and the key results of the Delphi survey.

Based on our findings, we propose as the core list a subset of 22 ACSC diagnosis groups. These 22 out of 40 groups were chosen based on public health relevance and cover

Table 2
Full and core list (in bold) of consented ambulatory care-sensitive conditions.

No	Name	ICD-10
1	**Ischaemic heart diseases**	I20, I25.0, I25.1, I25.5, I25.6, I25.8, I25.9
2	**Heart failure**	I50
3	**Other diseases of the circulatory system**	I05, I06, I08.0, I49.8, I49.9, I67.2, I67.4, I70[b], I73, I78[b], I80.0[b], I80.80[b], I83[a], I86[b], I87[b], I95[a], R00.0, R00.2, R47.0
4	**Bronchitis & COPD**	J20, J21, J40-J44, J47
5	**Mental and behavioural disorders due to use of alcohol or opioids**	F10, F11[a]
6	**Back pain [dorsopathies][c]**	M42[a], M47[a], M53[b], M54[b]
7	**Hypertension**	I10-I15
8	**Gastroenteritis and other diseases of intestines**	K52.2, K52.8, K52.9, K57[b], K58[b], K59.0
9	**Intestinal infectious diseases**	A01, A02, A04, A05, A07-A09
10	**Influenza and pneumonia**	J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.8, J15.9, J16.8, J18.0, J18.1, J18.8, J18.9
11	**Ear nose throat infections**	H66, J01-J03, J06, J31, J32[b], J35[a]
12	**Depressive disorders[c]**	F32[b], F33[b]
13	**Diabetes mellitus**	E10.2-E10.6, E10.8, E10.9, E11, E13.6, E13.7, E13.9, E14, E16.2
14	**Gonarthrosis [arthrosis of knee]**	M17.0[b], M17.1[b], M17.4[b], M17.5[b], M17.9[b]
15	**Soft tissue disorders**	G56.0[b], M67.4, M71.3, M75-M77[b], M79[b]
16	**Other avoidable mental and behavioural disorders**	F40[b], F41[b], F43[a], F45[a], F50.0[b], F50.2[b], F60[a]
17	**Diseases of the eye**	H25[a], H40[a]
18	**Diseases of urinary system**	N30, N34, N39.0
19	**Sleep disorders[c]**	G47[a]
20	**Diseases of the skin and subcutaneous tissue**	A46, L01, L02, L04, L08.0, L08.8, L08.9, L60.0, L72.1, L98.0
21	Thyroid disorder	E03-E05
22	Metabolic disorders	E86, E87.6, E89.0
23	Melanoma and other malignant neoplasms of skin	C43, C44
24	Gastritis and duodenitis	K21, K29.7, K29.9, K30, K31[b]
25	Migraine and headache syndromes	G43, G44.0, G44.1, G44.3, G44.4, G44.8, R51
26	**Malnutrition & nutritional deficiencies**	D50, D51-D52[b], D53.1[b], D56[b] E40-64, R63.6[b]
27	Alcoholic liver disease	K70[a]
28	**Dental diseases**	K02, K04-K06, K08, K12, K13
29	Inflammatory diseases of female pelvic organs and disorders of female genital tract	N70-N72, N75, N76, N84.1, N86, N87
30	Dementia	F01, F03
31	Maternal disorders related to pregnancy	O23, O24[b]
32	Diseases of male genital organs	N41[b], N45[b], N48.4[b]
33	Asthma	J45
34	Other polyneuropathies	G62[b]
35	Avoidable infectious and parasitic diseases	A15.3, A15.4, A15.9, A16.2, A16.3, A16.5, A16.8, A16.9, A34-A37, A50-A58, A63, A64, A80, B05-B07, B15, B16.1, B16.9, B17, B18.0, B18.1, B20-B24[b], B26, B34.9, B51-B54, B77, B86[b]
36	Convulsions, not elsewhere classified	R56
37	Decubitus ulcer and pressure area	L89[b]
38	Obesity	E66[b]
39	Perforated, bleeding ulcer	K25.9, K27, L97
40	Rare diseases with <5000 cases each	F80[b], R63.0[b], R63.3, R63.8[b], Z73[b]

[a] Identified in empirical study of regional variation.

[b] Proposed by panelists.

[c] May not fullfil criterion v.

90% of hospital cases of all consented ACSH and all conditions with an estimated preventability of more than 85%. Table 2 shows the ICD-10 codes of all 40 ACSC diagnosis groups ranked according to the number of hospital cases, with the 22 core ACSC groups in bold.

Table 3 presents for the year 2012 the absolute number of hospital cases attributable to the 22 core ACSC diagnosis groups, their estimated degree of preventability [ranging from 0% to 100%], the number of absolute cases multiplied by the degree of preventability, and the most frequently named medical action and systemic measure to reduce ACSH for the respective condition.

Some studies on ACSC place emphasis on investigating unplanned rather than elective admissions for ACSC [38–40]. Unplanned or emergency admissions represent 42% (7.5 million) of all admissions in Germany, with an increasing trend. In the German context, however, a focus on emergency admissions is problematic for two main reasons. First, a higher rate of hospitalisations for ACSC might indicate problems regarding access to care (e.g. lower physician density as a consequence of inadequate capacity planning in the ambulatory sector), even if the hospitalisations were planned. Secondly, the labelling of emergency cases is error-ridden and does not necessarily reflect the true reason for hospitalisation [41]. Nevertheless, in order to assess the sensitivity of our results, we present in Table 3 the proportion of emergency admissions for the 22 core ACSC and the number of emergency admissions multiplied by their degree of preventability.

Table 3
Summary of results on hospitalisations for ACSC, the degree of preventability, emergency cases and the medical actions [MoCD: Management of chronic diseases; OPP: other primary prevention; ETaD: effective treatment of acute disease] and strategies to reduce ACSH [ICT: improvement of continuous treatment]; ***: many not fully fullfil crtierion v.

Diagnosis group	Number of hospitalisations in thousands (2012)	Number of estimated preventable hospitalisations in thousands	Percentage of estimated preventability	Number of estimated preventable emergency cases	Percentage of emergency cases	Most often mentioned medical action to reduce ACSH	Most often mentioned systemic change to reduce ACSH
Ischaemic heart diseases	426	260	61%	75	29%	MoCD	ICT
Heart failure	381	246	64%	81	33%	MoCD	ICT
Other diseases of the circulatory system	370	282	76%	86	31%	MoCD	ICT
Bronchitis & COPD	320	245	76%	138	57%	MoCD	ICT
Mental and behavioural disorders due to use of alcohol or opioids	315	209	66%	135	65%	OPP	ICT
Back pain [dorsopathies]***	284	231	81%	84	37%	OPP	ICT
Hypertension	279	231	83%	132	58%	OPP	ICT
Gastroenteritis and other diseases of intestines	263	202	77%	110	55%	MoCD	ICT
Intestinal infectious diseases	259	195	75%	136	70%	OPP	ICT
Influenza and pneumonia	256	175	68%	108	63%	ETaD	ICT
Ear nose throat infections	252	214	85%	37	18%	ETaD	ICT
Depressive disorders***	251	175	70%	53	31%	MoCD	ICT
Diabetes mellitus	196	160	81%	59	37%	MoCD	ICT
Gonarthrosis [arthrosis of knee]	190	110	58%	4	4%	MoCD	ICT
Soft tissue disorders	183	134	73%	20	16%	ETaD	ICT
Other avoidable mental and behavioural disorders	175	129	74%	62	49%	MoCD	ICT
Diseases of the eye	153	124	81%	9	8%	MoCD	ICT
Diseases of urinary system	146	126	86%	68	55%	ETaD	ICT
Sleep disorders***	127	105	83%	5	6%	MoCD	ICT
Diseases of the skin and subcutaneous tissue	125	96	77%	51	54%	ETaD	ICT
Malnutrition & nutritional deficiencies	49	42	85%	11	28%	OPP	ICT
Dental diseases	36	33	94%	10	32%	OPP	ICT

On the basis of the core ACSC list, 5.04 million German hospital admissions in 2012 may be considered sensitive to ambulatory care. Expert opinion would estimate that approximately 3.7 million of these cases were actually preventable. If only emergency-coded admissions are considered, the number of ACSH reduces to 1.48 million cases. The degree of estimated preventability ranges from 58% for gonarthrosis to 94% for dental diseases. Of interest is that some ACSC listed in at least four of the nine existing ACSC lists were not included in the present study (epilepsy; acute appendicitis; sub-codes of infection of kidney, perforated ulcus and type 1 diabetes), whereas additional conditions not previously listed were identified by the survey (e.g. back pain, depressive symptom, sleep disorders, gonarthrosis).

The newly identified ACSC were verified by a committee of three physicians, who reviewed criteria iii-v following the Delphi analysis. The committee noted that back pain, depression and sleep disorder may not fully meet criterion v regarding the necessity of hospitalisation for the condition. These ACSC are therefore marked with c) in Table 2. Conditions identified in the empirical investigation of regional variation are marked with a) and conditions proposed by the panellists with b).

When asked which medical action might reduce the rate of ACSH, most experts proposed more effective management of chronic diseases, followed by the early detection of disease and effective treatment. Immunisation had, as expected, a minor overall relevance.

When asked which changes were necessary in the German ambulatory care sector to reduce the rate of ACSH, the vast majority of physicians suggested greater continuity of ambulatory treatment followed by better access to care, reduction in medical uncertainty and changes to the remuneration system (see Fig. 1). For all 22 core ACSC, 'strengthening the continuity of care' was ranked top by the panelists (see Table 3).

Fig. 2 shows the geographic distribution of age-standardized rates of hospitalisations for ACSC per 100 000 inhabitants at the district level, based on the core ACSC list and using data from the year 2012. The maps show high rates in rural areas of the former East Germany, North Rhine, Saarland and northern and eastern Bavaria. Fig. 2 is similar to previous maps which were based on the English NHS list of ACSC to depict regional variation of ACSH in Germany [2,42] but with higher concentrations in Nord-Rhine-Westphalia and mid Germany and lower rates in East Germany.

4. Discussion

In most European health systems, ambulatory care will be the cornerstone of ongoing care for an ageing population [1]. Quality monitoring is therefore an important tool to support effective and efficient ambulatory care. In the present study, we applied consensus methods to improve the acceptance of ACSC and contributed to the literature by evaluating for each condition the degree of preventability in a systematic fashion. Furthermore, we surveyed the medical care and systemic changes that could reduce the rate of hospitalisation for ACSC.

Of 5.04 million hospital cases classified as ambulatory care-sensitive by the panel, the estimated degree of preventability would suggest that 3.7 million were
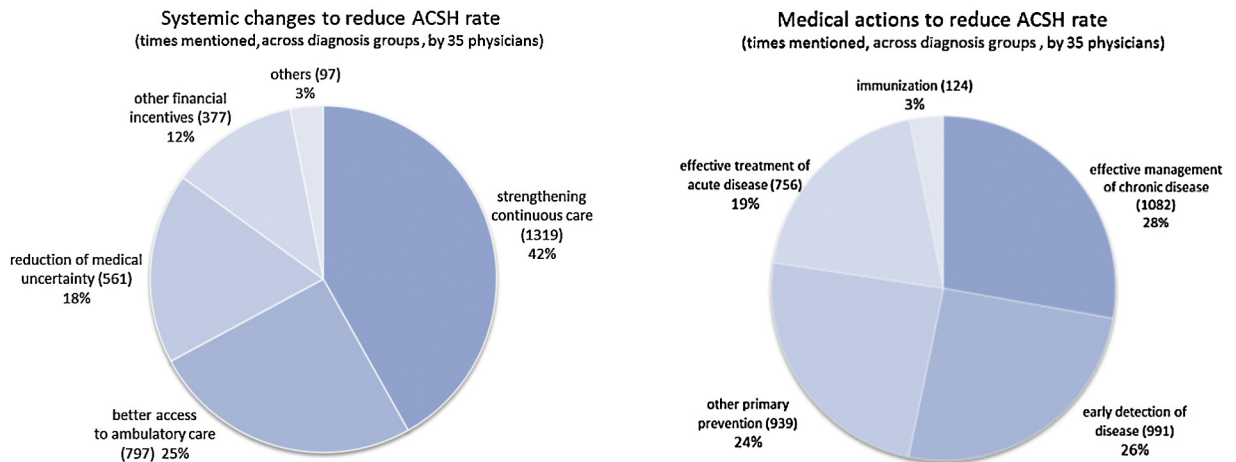
Systemic changes to reduce ACSH rate
(times mentioned, across diagnosis groups, by 35 physicians)

others (97)
3%

other financial
incentives (377)
12%

strengthening
continuous care
(1319)
42%

reduction of medical
uncertainty (561)
18%

better access
to ambulatory care
(797) 25%

Medical actions to reduce ACSH rate
(times mentioned, across diagnosis groups, by 35 physicians)

immunization (124)
3%

effective treatment of
acute disease (756)
19%

effective management
of chronic disease
(1082)
28%

other primary
prevention (939)
24%

early detection of
disease (991)
26%

Fig. 1. Systemic changes and medical actions needed to reduce ACSH rates.

Women total
3944 1501 – 4938 5671
4938 5671 – 5311 6408
5311 6408 – 5761 2884
5761 2884 – 6081 3729
6081 3729 – 6316 2190
6316 2190 – 6653 6497
6653 6497 – 6982 1088
6982 1088 – 7385 8712
7385 8712 – 7910 5966
7910 5966 – 9745 5381

Men total
3947 1252 – 4860 2977
4860 2977 – 5235 5749
5235 5749 – 5499 5572
5499 5572 – 5875 4400
5875 4400 – 6128 2334
6128 2334 – 6468 5300
6468 5300 – 6838 7166
6838 7166 – 7194 8525
7194 8525 – 7660 6632
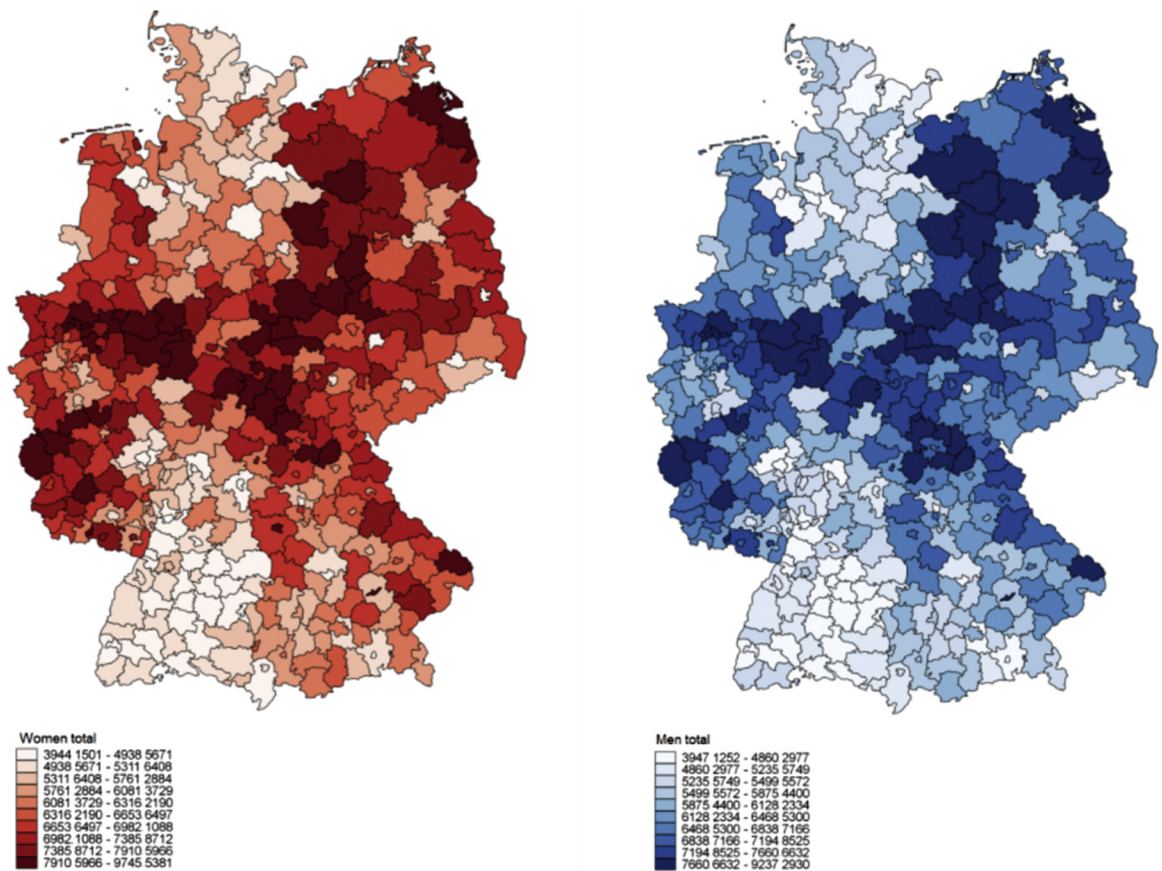7660 6632 – 9237 2930

Fig. 2. Geographical distribution of ambulatory care-sensitive hospitalisations in Germany for women and men, 2012. The rates are age-standardized.

avoidable. This amounts to 27% classified and 20% pre-ventable cases of all 18.6 million German hospital cases in the year 2012. Considering only emergency cases, the ACSH share is reduced to less than 8% but still represents high potential for quality improvement, for increasing the patients' quality of life and for reducing health care costs.

There are several good reasons why process indica-tors prevail in the assessment of ambulatory care. ACSH rates can however complete the picture by providing use-ful information related to patient outcomes and identifying small areas or practice networks with problems that might need addressing. The geographic distribution of ACSH indi-cates significant regional variation with particularly high

rates and potential for improvement in the North-Rhine region and in Thuringia, Saxony-Anhalt, Northern and Eastern Bavaria and the Saarland.

Although the Delphi-panelists were recruited from different medical disciplines and practice in diverse settings, their ratings were surprisingly consistent and high rates of consensus were achieved. In the third round, the ACSC reached an average approval rating of 98%, with a minimum rating of 87%. Differences in the selection of ACSC in comparison to previous lists do however demonstrate the need for combining all existing evidence with setting-specific consensus. In this context, Marshall et al. stress that considerable benefit can be gained by using existing work from other settings when developing quality indicators, but that it is important to account for variation in professional culture and clinical practice [43].

Assessing the degree of preventability addresses the limitation that ACSH are influenced by a number of factors outside of the control of the ambulatory sector. These are often difficult to adjust for, especially when analysing aggregated small area data. An estimate of the degree of preventability of each ACSC illustrates the potential for improvement in ambulatory treatment of the disease and indicates the specific reliability of the measure. Among the core ACSC, the preventability ranged from 58% for gonarthrosis to 94% for dental diseases, with an average preventability of 75% across all diagnosis groups.

The most often mentioned strategy for reducing ACSH was 'improving continuous care'. Interruptions in the continuity of care are most common when a patient does not have an ambulatory care physician who coordinates her or his care. While many patients decide to consult the same GP on a regular basis, there is no obligation to do so in Germany. Patients may utilise practically any physician anywhere in the country, meaning that physicians may not be aware if the patient is being treated for the same or similar condition by a colleague. This potential lack of coordination may harm the patient, for example through the parallel prescription of contraindicating medication, and lead to inefficiencies, for example through duplicated treatment and diagnostic testing.

Similar to the lack of intra-sector coordination, there is no systematic coordination in Germany between the ambulatory care sector, hospitals, rehabilitation centres and long-term care. GPs are not directly informed of their patients' discharge from hospital. Instead, patients are handed a discharge note to pass on to their physician, describing their diagnosis and treatment (regulated by the Social Code Book V). However, such notes are not always issued promptly on discharge and it is the patient's responsibility to ensure that the necessary follow-up consultations are scheduled with the ambulatory physician. This is likely to disadvantage vulnerable patient groups. Increasing disease burden in ageing societies has the potential to further increase the fragmentation of care in most European health care systems, including Germany.

Some limitations of the study have to be considered when interpreting the results. First, it is important to note that the existence of consensus does not mean that the "correct" ACSC list, opinion or judgement has been found. It merely helped to identify and establish those ACSC that the panelists considered important [25]. Concerns have, for example, been raised regarding the consistency with which different panels of experts identify appropriate hospitals admissions [44,45]. The results of our analysis should therefore be used as a means of raising issues for debate and may encourage further confirmatory studies. Secondly, the estimated degree of preventability remains ultimately subjective and most likely reflects the professional experience of the participating physicians. Future research on the preventability of hospitalisations, informed both by evidence and by consensus methods in large groups, would be desirable.

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Competing interests

No conflicts declared.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.healthpol.2015.08.007.

References

[1] Smith P, editor. Performance measurement for health system improvement: experiences, challenges and prospects. Cambridge: Cambridge University Press; 2010. p. 748. https://books.google.com/books?id=CCLaAgAAQBAJ&pgis=1 [accessed 28.01.15].

[2] Sundmacher L, Kopetsch T. The impact of office-based care on hospitalizations for ambulatory care sensitive conditions. Eur J Heal Econ 2014, http://dx.doi.org/10.1007/s10198-014-0578-4.

[3] Van Loenen T, van den Berg MJ, Westert GP, Faber MJ. Organizational aspects of primary care related to avoidable hospitalization: a systematic review. Fam Pract 2014;31(5):502–16, http://dx.doi.org/10.1093/fampra/cmu053.

[4] Gibson OR, Segal L, McDermott RA. A systematic review of evidence on the association between hospitalisation for chronic disease related ambulatory care sensitive conditions and primary health care resourcing. BMC Health Serv Res 2013;13:336, http://dx.doi.org/10.1186/1472-6963-13-336.

[5] Trachtenberg AJ, Dik N, Chateau D, Katz A. Inequities in ambulatory care and the relationship between socioeconomic status and respiratory hospitalizations: a population-based study of a Canadian city. Ann Fam Med 2014;12(5):402–7, http://dx.doi.org/10.1370/afm.1683.

[6] Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. J Am Med Assoc 1992;268(17):2388–94. http://www.ncbi.nlm.nih.gov/pubmed/1404795 [accessed 15.01.15].

[7] Alfradique ME, Bonolo PDF, Dourado I, et al. [Ambulatory care sensitive hospitalizations: elaboration of Brazilian list as a tool for measuring health system performance (Project ICSAP-Brazil)]. Cad Saude Publica 2009;25(6):1337–49. http://www.ncbi.nlm.nih.gov/pubmed/19503964 [accessed 15.01.15].

[8] Faisst C, Sundmacher L. Ambulatory care-sensitive conditions: an international overview with conclusions for a German catalogue. Gesundheitswesen 2014, http://dx.doi.org/10.1055/s-0034-033.1377.

[9] Campbell SM, Braspenning J, Hutchinson A, Marshall MN. Research methods used in developing and applying quality indicators in primary care. Br Med J 2003;326(7393):816–9, http://dx.doi.org/10.1136/bmj.326.7393.816.

[10] Barnett R, Malcolm L. Practice and ethnic variations in avoidable hospital admission rates in Christchurch, New Zealand. Health Place 2010;16(2):199–208, http://dx.doi.org/10.1016/j.healthplace.2009.09.010.

[11] Kim H, Helmer DA, Zhao Z, Boockvar K. Potentially preventable hospitalizations among older adults with diabetes. Am J Manag Care 2011;17(11):e419–26. http://www.ncbi.nlm.nih.gov/pubmed/22200058 [accessed 9.01.15].

[12] Longman JM, Rolfe MI, Passey MD, et al. Frequent hospital admission of older people with chronic disease: a cross-sectional survey with telephone follow-up and data linkage. BMC Health Serv Res 2012;12:373, http://dx.doi.org/10.1186/1472-6963-12-373.

[13] Balogh R, Brownell M, Ouellette-Kuntz H, Colantonio A. Hospitalisation rates for ambulatory care sensitive conditions for persons with and without an intellectual disability – a population perspective. J Intellect Disabil Res 2010;54(9):820–32, http://dx.doi.org/10.1111/j.1365-2788.2010.01311.x.

[14] Walker RL, Chen G, McAlister FA, et al. Relationship between primary care physician visits and hospital/emergency use for uncomplicated hypertension, an ambulatory care-sensitive condition. Can J Cardiol 2014;30(12):1640–8, http://dx.doi.org/10.1016/j.cjca.2014.09.035.

[15] Ansari Z, Laditka JN, Laditka SB. Access to health care and hospitalization for ambulatory care sensitive conditions. Med Care Res Rev 2006;63(6):719–41, http://dx.doi.org/10.1177/1077558706293637.

[16] Giuffrida A, Gravelle H, Roland M. Measuring quality of care with routine data: avoiding confusion between performance indicators and health outcomes. Br Med J 1999;319(7202):94–8, http://dx.doi.org/10.1136/bmj.319.7202.94.

[17] White BM, Ellis Jr C, Simpson KN. Preventable hospital admissions among the homeless in California: a retrospective analysis of care for ambulatory care sensitive conditions. BMC Health Serv Res 2014;14(1):511, http://dx.doi.org/10.1186/s12913-014-0511-7.

[18] 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 (Millwood) 1993;12(1):162–73. http://www.ncbi.nlm.nih.gov/pubmed/8509018 [accessed 15.01.15].

[19] Berlin C, Busato A, Rosemann T, Djalali S, Maessen M. Avoidable hospitalizations in Switzerland: a small area analysis on regional variation, density of physicians, hospital supply and rurality. BMC Health Serv Res 2014;14:289, http://dx.doi.org/10.1186/1472-6963-14-289.

[20] Freund T, Campbell SM, Geissler S, et al. Strategies for reducing potentially avoidable hospitalizations for ambulatory care-sensitive conditions. Ann Fam Med 2013;11(4):363–70, http://dx.doi.org/10.1370/afm.1498.

[21] Caminal J, Starfield B, Sánchez E, Casanova C, Morales M. The role of primary care in preventing ambulatory care sensitive conditions. Eur J Public Health 2004;14(3):246–51. http://www.ncbi.nlm.nih.gov/pubmed/15369028 [accessed 15.01.15].

[22] Solberg LI, Peterson KE, Ellis RW, et al. The Minnesota project: a focused approach to ambulatory quality assessment. Inquiry 1990;27(4):359–67. http://www.ncbi.nlm.nih.gov/pubmed/2148309 [accessed 15.01.15].

[23] International Statistical Classification of Diseases and Related Health Problems 10th Revision. http://apps.who.int/classifications/icd10/browse/2015/en.

[24] Campbell SM, Braspenning J, Hutchinson A, Marshall M. Research methods used in developing and applying quality indicators in primary care. Qual Saf Health Care 2002;11(4):358–64. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1758017&tool=pmcentrez&rendertype=abstract [accessed 28.01.15].

[25] Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs 2000;32(4):1008–15. http://www.ncbi.nlm.nih.gov/pubmed/11095242 [accessed 28.01.15].

[26] Epley N, Gilovich T. Putting adjustment back in the anchoring and adjustment heuristic: differential processing of self-generated and experimenter-provided anchors. Psychol Sci 2001;12(5):391–6, http://dx.doi.org/10.1111/1467-9280.00372.

[27] Avendano M, Kawachi I. Why do Americans have shorter life expectancy and worse health than do people in other high-income countries? Annu Rev Public Health 2014;35:307–25, http://dx.doi.org/10.1146/annurev-publhealth-032013-182411.

[28] O'Malley KJ, Cook KF, Price MD, Wildes KR, Hurdle JF, Ashton CM. Measuring diagnoses: ICD code accuracy. Health Serv Res 2005;40(5 Pt 2):1620–39, http://dx.doi.org/10.1111/j.1475-6773.2005.00444.x.

[29] Fink A, Kosecoff J, Chassin M, Brook RH. Consensus methods: characteristics and guidelines for use. Am J Public Health 1984;74(9):979–83. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1651783&tool=pmcentrez&rendertype=abstract [accessed 28.01.15].

[30] Purdy S, Paranjothy S, Huntley A, Thomas R, Mann M, Huws D, et al. Interventions to reduce unplanned hospital admission: a series of systematic reviews; 2012.

[31] Harrison MJ, Dusheiko M, Sutton M, Gravelle H, Doran T, Roland M. Effect of a national primary care pay for performance scheme on emergency hospital admissions for ambulatory care sensitive conditions: controlled longitudinal study. Br Med J 2014;349:g6423.

[32] Gray BM, Vandergrift JL, Johnston MM, et al. Association between imposition of a Maintenance of Certification requirement and ambulatory care-sensitive hospitalizations and health care costs. J Am Med Assoc 2014;312(22):2348–57, http://dx.doi.org/10.1001/jama.2014.12716.

[33] Millman M. Access to health care in America. Washington, DC: National Academies Press (US); 1993.

[34] Brown AD, Goldacre MJ, Hicks N, et al. Hospitalization for ambulatory care-sensitive conditions: a method for comparative access and quality studies using routinely collected statistics. Can J Public Health 2001;92(2):155–9. http://www.ncbi.nlm.nih.gov/pubmed/11338156 [accessed 15.01.15].

[35] Sanderson C, Dixon J. Conditions for which onset or hospital admission is potentially preventable by timely and effective ambulatory care. J Health Serv Res Policy 2000;5(4):222–30. http://www.ncbi.nlm.nih.gov/pubmed/11184959 [accessed 15.01.15].

[36] Zealand M of H of N. Our health, our future: the health of New Zealanders; 1999. http://www.moh.govt.nz/notebook/nbbooks.nsf/0/B7A04EBC77F80D244C256880007CEDFD/$file/honz99honz.pdf.

[37] Hutchinson A, Ambrose S, Glover J, Hetzel D. Atlas of avoidable Hospitalisations in Australia: ambulatory care-sensitive conditions. Public Health – Commonealth of Australia; 2007. http://digital.library.adelaide.edu.au/dspace/handle/2440/45319.

[38] Purdy S, Griffin T, Salisbury C, Sharp D. Ambulatory care sensitive conditions: terminology and disease coding need to be more specific to aid policy makers and clinicians. Public Health 2009;123(2):169–73, http://dx.doi.org/10.1016/j.puhe.2008.11.001.

[39] Purdy S, Griffin T, Salisbury C, Sharp D. Emergency admissions for coronary heart disease: a cross-sectional study of general practice, population and hospital factors in England. Public Health 2011;125(1):46–54, http://dx.doi.org/10.1016/j.puhe.2010.07.006.

[40] Johnson PJ, Ghildayal N, Ward AC, Westgard BC, Boland LL, Hokanson JS. Disparities in potentially avoidable emergency department (ED) care: ED visits for ambulatory care sensitive conditions. Med Care 2012;50(12):1020–8, http://dx.doi.org/10.1097/MLR.0b013e318270bad4.

[41] Schreyögg J, Bäuml M, Krämer J. Forschungsauftrag Zur Mengenentwicklung Nach § 17b Abs. 9 KHG; 2014. http://www.dkgev.de/media/file/17192.2014-07-10_Anlage_Forschungsbericht-zur-Mengenentwicklung_FIN.pdf.

[42] Naumann C, Augustin U, Sundmacher L. [Ambulatory care-sensitive conditions in Germany: a small area analysis (2006–2009)]. Gesundheitswesen 2014, http://dx.doi.org/10.1055/s-0034-1372576.

[43] Marshall MN, Shekelle PG, McGlynn EA, Campbell S, Brook RH, Roland MO. Can health care quality indicators be transferred between countries? Qual Saf Health Care 2003;12(1):8–12. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1743668&tool=pmcentrez&rendertype=abstract [accessed 28.01.15].

[44] Hicks NR. Some observations on attempts to measure appropriateness of care. Br Med J 1994;309(6956):730–3. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2540824&tool=pmcentrez&rendertype=abstract [accessed 9.07.15].

[45] Kassirer JP. The quality of care and the quality of measuring it. N Engl J Med 1993;329(17):1263–5, http://dx.doi.org/10.1056/NEJM199310213291710.