Decision support in hospital care for older patients

Medication, falls and delirium

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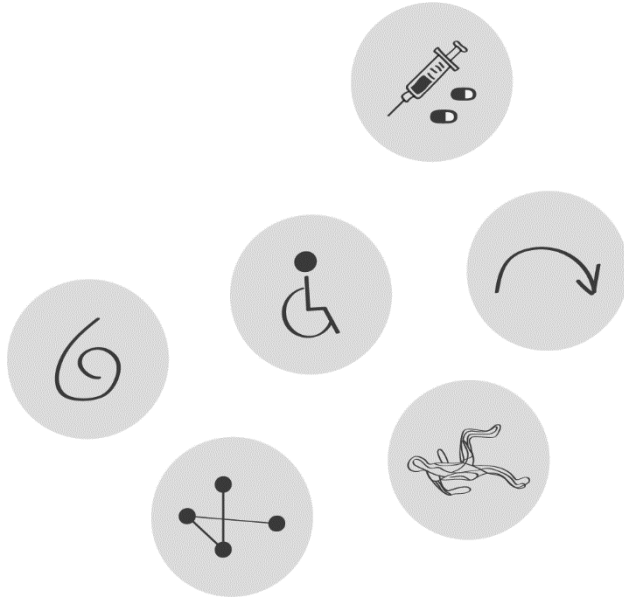
Priority setting in improving hospital care for older patients using clinical decision support



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Abstract

Background: Despite rising attention and successful interventions, the quality of hospital care for older people remains suboptimal in some areas. Clinical Decision Support Systems (CDSSs) can increase implementation of geriatric knowledge and improve quality of care (QoC).

Objective: This study was designed to set priorities in improving hospital care for older patients using CDSSs as an intervention strategy.

Methods: We performed a modified three-round Delphi study and a national follow-up survey. The Delphi study consisted of (1) semi-structured interviews, (2) a consensus meeting, and (3) a digital survey.

Results: Twelve experts from six Dutch hospitals participated in the Delphi study, and seventy-three healthcare professionals participated in the national follow-up survey. The expert panel reached consensus on six causes of suboptimal hospital care for older patients with opportunities to improve care with a CDSS. Of these six, "discharge and aftercare" and "medication review" were deemed most important. The other four were "fall prevention", "delirium care", "planning" and "communication with patients at discharge". CDSS priorities included improving interoperability between in- and outpatient IT systems, support for medication review, delivering personalized interventions to prevent falls and delirium, and for improving communication at discharge.

Conclusions: Our findings are of interest to those working to improve the QoC for older patients. Focusing CDSS development efforts to support "discharge and aftercare" and "medication review" should improve user acceptance and commitment and be beneficial for older patients.

Introduction

Worldwide, the proportion and number of older adults have grown substantially and will continue to grow in the coming decades.[43] The increasing number of older adults is gradually influencing hospitals in both organizational and medical aspects. Despite rising attention and successful interventions, the quality of hospital care for older people remains suboptimal in some areas.[44] Healthcare professionals need to adopt a specific approach for older, complex patients that takes into account the patients' vulnerability to adverse events, as well as individual preferences.[44,45] Geriatric knowledge needed for this adoption is described in guidelines. However, implementation into daily practice is complex. Clinical Decision Support Systems (CDSSs) can support implementation of guidelines and improve quality of care (QoC).[28,29]

A CDSS is defined as "any computer program designed to help healthcare professionals to make clinical decisions". A CDSS can help transfer knowledge to healthcare professionals and can teach them about the preferred management.[30] A CDSS has already been shown to improve quality of care for older patients.[46] However, a CDSS is not always successful, and one possible reason is that the support the system offers is not in line with what healthcare professionals consider as priorities for them and their patients, leading to the perception that the CDSS does not offer relevant information. Healthcare professionals may feel that the CDSS does not follow their workflow, gives too many reminders or that the content of the CDSS is unclear or complex.[47–49] Another possible reason is that the selection of CDSS as an implementation strategy is not optimal. For example, guideline implementations with barriers such as lack of resources or time were not improved by a CDSS.[31] Design and implementation problems may lead to the CDSS going unused.[48] A user-centered design is preferred in the (initial) design phase and the selection of an electronic tool should be based on the needs of the users and organization.[38,47]

Currently, clinicians' preferences and priorities for CDSS to support geriatric care are not known. Therefore, we conducted an expert consensus study followed by a national survey with the aim to identify causes of suboptimal hospital care for older patients and set priorities for CDSSs as perceived by a multidisciplinary team of healthcare professionals.

Methods

We performed a modified Delphi study with three rounds and a national follow-up survey (Figure 2.1).

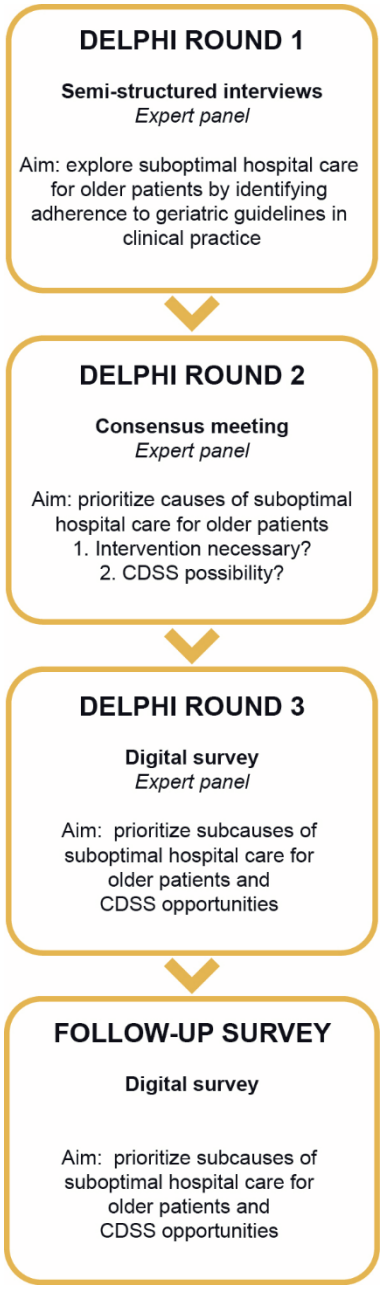

Figure 2.1. Flowchart of the data collection

Participants

For the three Delphi rounds, a multidisciplinary expert panel was formed. The members of the panel were healthcare professionals with a specialty in geriatrics, clinical pharmacology or QoC, and additional experience in designing, implementing and evaluating complex QoC interventions through research or participation in hospital committees. For the national follow-up survey, participants had similar clinical backgrounds as the experts, but without the additional requirement of experience in care improvement.

Round 1

The first Delphi round consisted of semi-structured interviews.[50] The interview questions were based on the topics of the Dutch guidelines for geriatric medicine.[51–56] An illustration of a general care process model was used to prompt the experts to consider each step of the care process.[57,58] The experts were asked to subjectively assess adherence to guidelines and quality indicators in clinical practice with the use of a rating scale. If adherence was low, the reasons were discussed and categorized according to Cabana's classification of reasons for guideline non-adherence.[59]

Members of the SCOPE study team (one geriatrician, two medical informatics specialists and one pharmacist) were responsible for inclusion of guidelines and indicators and formulating the questions.

The interviews were conducted by one researcher (BD) and with permission audio-recorded. Written notes were also taken during the interviews in case the recording failed. The interviews were transcribed and coded independently by two researchers (BD and KP). The results were discussed until consensus between the two researchers was reached.[60] An initial code tree was developed on three axes: phase of care (e.g. admission), clinical problem (e.g. delirium) and reason for non-adherence (e.g. lack of knowledge). Comments that were relevant to the research questions but did not fit in the initial code tree were categorized using open coding. Finally, axial coding was used to relate the codes to each other. The data was visualized using a Fishbone diagram, a tool from lean management which can be used to propose causes for a general problem.[61] The resulting Fishbone diagram was checked by a senior geriatrician (NV).

Round 2

In a consensus meeting, the results were presented, prioritized and discussed. The results from round 1 were organized by two researchers (BD and KP) into a presentation, including all causes of suboptimal care that were mentioned by at least half of the participating experts. The presentation showed a brief description of the (sub)causes, clinical relevance and CDSS opportunities. The (sub)causes were linked to the classification of Cabana and Ahituv's generic model of information flow, a model containing four steps (e.g. data interpretation and making a decision).[62]

At the start of the meeting, the causes were independently rated and prioritized by the experts for two questions: "Is an intervention necessary?" and "Is an intervention with CDSS a possibility?" The first question was rated with: not wanted, not important, important, very important, essential. The second question was rated with: no, maybe/I don't know, absolutely. Consensus was achieved if each expert rated the first question with (very) important or essential and the second question with maybe/I don't know or absolutely. Causes with no consensus were discussed during the consensus meeting. After the discussion, the experts had the opportunity to change their ratings. The causes were prioritized by asking participants how they would distribute 100 euros among the causes.

The results were sent in a report by email to the experts for feedback and final check. Additionally, the identified CDSS opportunities were reviewed by a medical informatics specialist (SM) to clarify CDSS opportunities or to add opportunities that may not have been known to the healthcare professionals.

Round 3

Round 3 consisted of an online survey in Google Forms, including the causes on which experts reached consensus. The aim was to prioritize the subcauses and CDSS opportunities per cause by distributing the 100 euros for the same questions as in round 2. If questions were not completed, experts were contacted face-to-face or by telephone and asked to fill in the missing questions.

National follow-up survey

An invitation to participate in an online survey in LimeSurvey was distributed through the national medical associations of geriatricians, internal medicine specialists and nurses, through social media and among hospital pharmacists and hospital QoC specialists. As in round 3 of the Delphi rounds, the survey contained the causes on which experts reached consensus. The aim of the survey was to prioritize at a national level the (sub)causes of suboptimal care and CDSS opportunities.

Analysis

Proportions to describe the results of round 2, round 3 and follow-up were calculated in R-studio version 3.4.3.

Ethics Statement

The SCOPE study was reviewed by the Medical Ethics Review Committee (METC) of Amsterdam UMC which deemed that an official approval – according to the Medical Research Involving Human Subjects Act (WMO) - was not required. All participants were informed in writing that the results of this study would be used for publication and CDSS development.

Results

Participants

Twelve experts from six Dutch hospitals were invited to participate in the modified Delphi procedure and all participated (Table 2.1). A total of seventy-three healthcare professionals participated in the national follow-up survey.

Table 2.1. Overview characteristics of the participants per round

	Round 1 (n=12)	Round 2 (n=12)	Round 3 (n=11)	National follow-up survey (n=73[a])
Sex, male (%)	5 (41.7)	5 (41.7)	5 (45.5)	19 (26)
Age, n (%)				
<35	-	-	-	2 (2.7)
35-44	6 (50)	6 (50)	6 (54.5)	29 (39.7)
45-54	4 (33.3)	4 (33.3)	3 (27.3)	21 (28.8)
55-64	2 (16.7)	2 (16.7)	2 (18.2)	13 (17.8)
>65	-	-	-	8 (11)
Specialty, n (%) [b]				
Specialist geriatrics (in training)	7 (58.3)	7 (58.3)	7 (63.6)	31 (42.5)
Internal medicine Specialist (in training) [c]	1 (8.3)	1 (18.3)	1 (9.1)	6 (8.2)
Hospital pharmacist (in training)	2 (16.7)	2 (16.7)	2 (18.2)	19 (26)
Nurse [d]	2 (16.7)	2 (16.7)	1 (9.1)	8 (11)
Hospital quality employee	1 (8.3)	1 (8.3)	1 (9.1)	5 (6.8)
Other [e]	-	-	-	4 (5.5)
Year of experience, n (%)				
0-5	-	-	-	22 (30.1)
6-10	1 (8.3)	1 (8.3)	1 (9.1)	23 (31,5)
11-15	3 (25)	3 (25)	3 (27.3)	8 (11)
16-20	2 (16.7)	2 (16.7)	2 (18.2)	4 (5.5)
21-25	3 (25)	3 (25)	2 (18.2)	5 (6.8)
>25	3 (25)	3 (25)	3 (27.3)	11 (15.1)
Additional expertise, n (%)				
Guideline development	6 (50)	6 (50)	6 (54.5)	-
Hospital committee (IT, pharmacology or geriatrics)	9 (75)	9 (75)	8 (72.7)	-
Research	10 (83.3)	10 (83.3)	10 (90.9)	-

[a] In total, 60 of the 73 respondents completed the questionnaire.
[b] Respondents could have more than one specialty or expertise
[c] Including 1 internist-nephrologist
[d] Including hart-failure nurse, transfer nurse, nurse researcher, and nurse geriatrics
[e] 2 Pharmacist (specialized in geriatric pharmacotherapy), physician assistant geriatrics, hospital doctor (in training)

Round 1

Eleven interviews were recorded and coded, and one interview was coded from notes taken during the interview (due to failure of the audio recording device). The interviews lasted for 45–60 minutes. Based on qualitative analysis of the interviews, five categories for suboptimal care were identified: "transfers", "communication and identification", "prevention and treatment", "medication", and "organization of care". Figure 2.2 shows that each category includes a minimum of three causes for suboptimal hospital care of older patients.

- Transfers and communication between healthcare professionals during transfer (12/12 interviews)

According to all experts, "transfers" are crucial care processes and currently suboptimal. For example, one expert said: "*During hospitalization, medication is stopped and not communicated [to the general practitioner]. Patients are discharged home and medication is unintentionally re-prescribed. The transfer is not done correctly.*" The category is divided into "admission" (10/12), "internal communication" (8/12) and "discharge and aftercare" (10/12).

- Communication with and identification of frail older patients (12/12 interviews)

This category was mentioned by all experts and included "suboptimal communication with patients at discharge" (8/12). As one expert said: "*Because if you discharge an older patient home and the communication with the patient is not good, they will come back [readmission]*." Other causes in this category were "insufficient geriatric knowledge" (5/12), "frailty screening" (5/12), "geriatric assessment" (4/12) and "suboptimal diagnostics" (3/12).

- Prevention & treatment (12/12 interviews)

All experts indicated "prevention & treatment" of geriatric conditions as a problem. This included "delirium care" (10/12). For example, one expert stated: "*I think that mainly doctors of surgery departments do not have the knowledge – [about] prevention of delirium or what you should do with it, both. And that you have to do all interventions for prevention.*" The other three causes were: suboptimal "fall prevention" (8/12), "malnutrition" (5/12) and "physical disabilities" (3/12).

- Medication (12/12 interviews)

All experts mentioned suboptimal medication management. As one expert said: "*It is complex, the medication of older patients who are hospitalized. Because of this, clinicians can't see the forest for the trees. So, there is a lack of knowledge*." Causes in this category describe insufficient "medication review" (10/12), "screening for adverse drug events at admission" (6/12), "monitoring during hospital stay" (3/12) and limited attention for "compliance" (2/12).

- Organization of geriatric care (11/12 interviews)

This last category was mentioned as a problem by eleven experts. It included suboptimal "planning" during hospital stay (7/12). As one expert said: "*At admission, the discharge date should already be planned.*" Furthermore, it included "integrated care" (5/12) and "responsibility" (3/12).

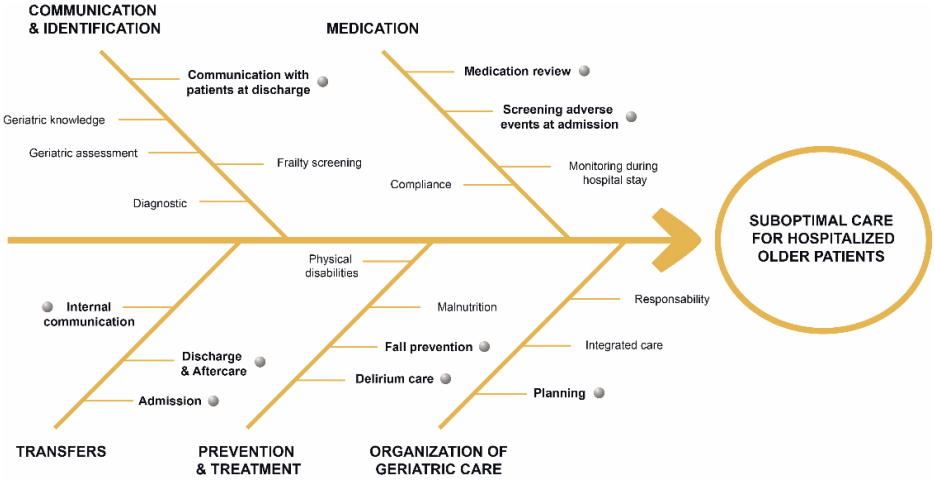

Figure 2.2. Fishbone diagram with causes of suboptimal hospital care for older patients. The causes in bold text, with a mark indicate causes that were mentioned by at least half of the experts

Round 2, round 3 & national follow-up survey

Round 2 started with the nine causes that were mentioned most often. These causes are shown in figure 2.2 in bold text with a mark. Experts reached consensus on seven of the nine causes for the need for an intervention and on six of the nine causes for CDSS opportunities. No consensus was reached for "admission" and "internal communication" on both questions and no consensus was reached for "screening for adverse drug reactions" on the CDSS question.

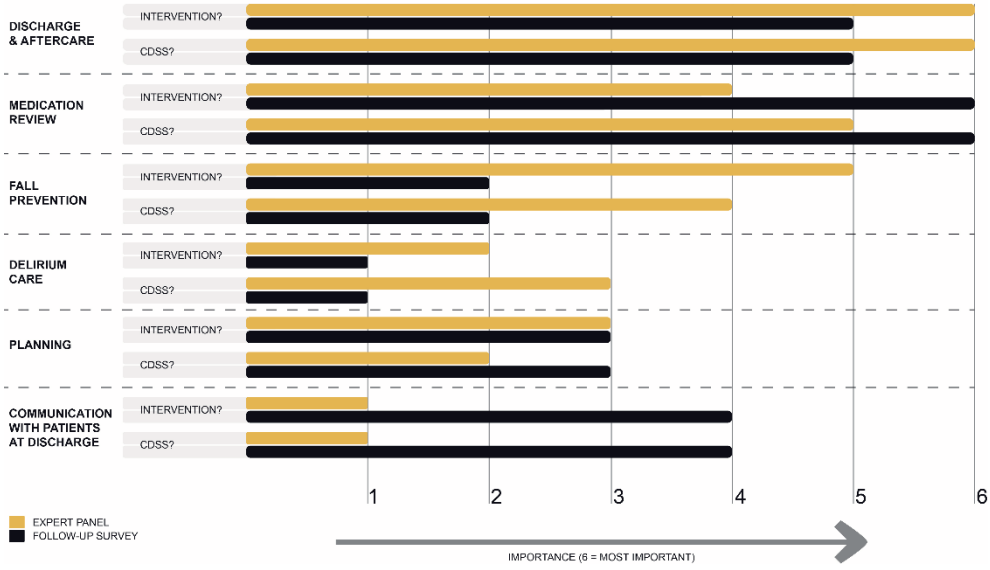

Figure 2.3. Prioritization of causes of suboptimal care by expert panel & national follow-up survey on two questions “Is an intervention necessary?” and “Is an intervention with CDSS a possibility?” The figure only includes the six causes with consensus in round 2.

According to the experts in the Delphi study and the participants of the national follow-up survey, “discharge & aftercare” and “medication review” are most important for improving care with CDSS (Figure 2.3). Table 2.2 shows the (sub)causes and the CDSS opportunities per cause.

Table 2.2. Highest rated subcauses and CDSS opportunities (in % of total per cause [a]) by expert panel (E) and national follow-up survey (F).

	Subcauses[b]			CDSS opportunities[b]		
		E (%)	F (%)		E (%)	F (%)
Discharge & Aftercare	Next caregiver does not receive medication changes	34.1	31.6	Connect in- and outpatient IT systems to re-use data in CDSS	38.2	39.6
	Medication is not checked at discharge	23.2	17.9	Support documentation of medication changes	20.9	15.5
Medication Review	Medication review is complex and time-consuming	45.2	52.3	Connect in- and outpatient IT systems to re-use data in CDSS	37.1	35.5
	Insufficient information for medication review	30.9	26.8	Support medication review at patient level	25.0	26.4
Fall prevention	Preventive interventions not done enough	28.5	22.6	Support in selecting personalized (preventive) interventions	29.6	28.9
	Interventions per patient are not visible	28.5	23.6	Positive feedback for screening and interventions	25.0	15.5
Delirium	Suboptimal execution of preventive interventions	28.3	23.9	Support in selecting personalized interventions	30.5	24.8
	Interventions per patient are not visible	21.5	13.7	Interventions and delirium score clearly visible	19.7	18.3
Planning	Too late with start mobilization	40.4	40.8	Support for nurse to give educational material for patients	36.6	38.5
	No geriatric assessment before hip fracture surgery	34.9	27.6	Reminder for geriatric assessment for older patients with hip fracture	33.3	30
Communication discharge	Communication with frail older patients is complex	50.9	43.5	Patient-friendly version of discharge communication	45.8	48.6
	Limited time at discharge to inform patients	49.1	56.5	Hand-over-tool	32.8	27.5

[a] This table shows the highest rated subcauses and CDSS opportunities per cause.
[b] Subcauses and CDSS opportunities are shown in order of most important per cause, according to the expert panel

Discussion

Our study identified nine prominent causes for suboptimal hospital care for older patients in the Netherlands. For six of these causes, consensus was reached on opportunities to improve care with CDSS. Of these six, “discharge and aftercare” and “medication review” were most important according to the expert panel and participants of the national follow-up survey.

In those areas, both groups prioritized “connecting in- and outpatient IT systems to re-use data in CDSS” and “support medication review at patient-level” as most important. The expert group and the national follow-up survey had different opinions as to how important “fall prevention”, “delirium care”, “planning” and “communication with patients at discharge” were for improving care with CDSS. The expert group stated that “fall prevention” was more important than the other areas and the national follow-up group rated “communication with patients at discharge” higher. However, the two groups did agree about the highest-rated CDSS opportunities within these areas. These were “support in selecting personalized (preventive) interventions”, “support for nurse to give educational material to patients about mobilizing” and “patient-friendly version of the discharge communication per email, printed or patient portal”.

To our knowledge, this is the first study that provides an overview of the priorities for CDSSs in improving hospital care for older patients from healthcare professionals' perspectives. Although most of the areas identified may have been broadly known to form challenges in the care of older adults, our study contributes to prioritizing these areas, and in addition, it does this also in the specific context of promising informatics applications. For example, transfers and availability of data were identified as problems by both our study and a Dutch position paper on care for vulnerable older patients.[22] Previous studies showed that transfer of medication information, including medication changes, between hospital and next healthcare providers was insufficient.[63,64] In 27% of all drug withdrawals because of an adverse drug event, unintentional represcription by general practitioners happened within 6 months after discharge.[65] Consistent with our respondents’ priority to support documentation of medication changes, van der Linden advises to optimize adverse drug event documentation in order to minimize unintentional represcription of drugs stopped during hospitalization because of adverse reactions.[66]

Successful improvements in care for hospitalized older patients through CDSSs have been described for some areas identified in our study.

Medication reconciliation at admission and discharge were supported by an electronic tool, accompanied by process redesign.[67] This intervention reduced potential adverse drug events at discharge.[67] Computerized interventions were shown to reduce potentially inappropriate prescriptions in a recent review, although more studies are needed to assess the cost-effectiveness and patient-related outcomes.[33] One study looked at the effect of a CDSS for medication review, the results were that the CDSS was not time-consuming and it was associated with a reduction in potentially inappropriate medications.[68] The fall rate was successfully reduced using a tool with personalized preventive interventions based on the patient's fall risk.[34] Delirium care was improved by an intervention with a CDSS and standardized care plans, resulting in a reduction of potentially inappropriate sedating medications and discharges to extended-care facilities.[69]

One of the strengths of our study is the use of double coding for analyzing the interviews to reduce potential bias. Additionally, we used a Delphi method with a multidisciplinary expert panel of healthcare professionals and independent assessment before and after the consensus meeting. Furthermore, we followed our Delphi panel with a national survey and showed that for the most part the results of the national survey and the Delphi study overlap. We used the Fishbone diagram, a care process model, and the “distributing 100 euro” technique which gives insights into different aspects, thus facilitating CDSS discussion and prioritization.

A limitation of our study is that the qualitative results are based on a small cohort from six hospitals in the Netherlands. However, this was mitigated by the diversity of the expert team which included experts in QoC, clinical pharmacology and geriatric knowledge. For the national follow-up survey, we were able to reach healthcare professionals through various distribution channels. A limitation following this approach is an unknown response rate and possible volunteer bias. Probably, people most interested in the subject participated. However, they are likely to be most knowledgeable about the problems and possible solutions. Furthermore, not all participants completed the whole survey, which implies a risk of participation bias. However, sub-analysis with the selection of 60 respondents who did finish the survey showed no difference in the main results.

In conclusion, our expert panel and national follow-up survey participants prioritized the suboptimal QoC areas “discharge & aftercare” and “medication review” as most important for improvement through CDSSs. An added value of this study is the investigation of areas where healthcare professionals want CDSSs and their opinions on what kind of CDSSs they want.

Our findings are of interest to those working to improve the quality of care for older patients and implementers of CDSSs. Although we cannot assume the results will reflect the wishes of other healthcare professionals in other countries, this is a good starting point for thinking about priorities of user-centered CDSSs. Focusing CDSS development efforts to support “discharge and aftercare” and “medication review” should improve user acceptance and commitment and be beneficial for older patients.