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# Improved medication communication and patient involvement at care transitions (IMPACT-care): study protocol for a pre-post intervention trial in older hospitalised patients

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3 4 5 6	1	TITLE
7 8 9	2	Improved medication communication and patient involvement at care
10 11 12	3	transitions (IMPACT-care): study protocol for a pre-post intervention trial in
13 14 15	4	older hospitalised patients
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2 3		
4	23	ABSTRACT
5		
6 7	24	Introduction
8		
9 10	25	Care transitions, particularly hospital discharge, present significant risks to patient safety. Deficient
11 12	26	medication-related discharge communication is a major contributor, posing a substantial risk of
13 14	27	harm to older patients. This protocol outlines the Improved Medication Communication and Patient
15 16 17	28	Involvement at Care Transitions (IMPACT-care) intervention study, designed to evaluate the effects
18 19	29	of a multi-faceted intervention for older hospitalised patients on medication-related discharge
20 21	30	communication compared to usual hospital care.
22 23	31	Methods and analysis
24 25 26	32	A pre-post intervention study will be conducted in two surgical and one geriatric ward of a university
27 28	33	hospital in Sweden. The study will begin with a control period delivering care as usual, followed by a
29 30	34	training period and then an intervention period. The intervention comprises four components
31 32	35	performed by clinical pharmacists: (1) an information package provided to patients and/or their
33 34 35	36	informal caregivers, (2) preparation of medication-related discharge documentation, (3) facilitation
36 37	37	of discharge communication, and (4) a follow-up call to patients or their informal caregiver. Eligible
38 39	38	participants are aged $\geq$ 65 years, manage their own medications independently or with informal
40 41	39	caregiver support, and are admitted to the study wards. Both study periods (control and
42 43	40	intervention) will last until a total of 115 patients have been included in each period. The primary
45 46	41	outcome is the quality of medication-related discharge documentation, assessed using the Complete
47 48	42	Medication Documentation at Discharge Measure (CMDD-M). Secondary outcomes include patients'
49 50	43	perceptions of involvement in discharge medication communication and their confidence in post-
51 52	44	discharge medication management, adherence to medication changes from hospitalisation that
55 55	45	persist after discharge, and unplanned healthcare visits following discharge. A process evaluation is
56 57	46	planned to explore how the intervention was implemented. Patient inclusion began in September
58 59 60	47	2024.

1		
2 3 4	48	Ethics and dissemination
5 6	49	The study protocol has been approved by the Swedish Ethical Review Authority (registration no.:
/ 8 9	50	2023-03518-01 and 2024-04079-02). Results will be published in open-access international peer-
10 11	51	reviewed journals, and presented at national and international conferences.
12 13	52	Trial registration number
14 15 16	53	NCT06610214
17 18 19	54	STRENGTHS AND LIMITATIONS OF THIS STUDY
20		
21 22 23	55	Uses a comprehensive, multi-faceted intervention designed to address gaps in medication
23 24 25	56	communication both during hospitalisation and after discharge.
26 27	57	• Conducted in both non-surgical and surgical wards, increasing the generalisability of findings
28 29	58	to other healthcare settings.
30 31 22	59	• The inclusion of a process evaluation provides insights into the implementation and
32 33 34	60	adherence to intervention components, offering valuable information to understand and
35 36	61	interpret the study findings.
37 38	62	• The pre-post design without randomisation limits the ability to establish causal relationships
39 40 41	63	between intervention and observed outcomes.
42 43	64	• Due to the complex, multi-faceted nature of the intervention, it is not possible to determine
44 45 46	65	which specific intervention components contribute most to the observed effects.
47 48 49	66	MAIN TEXT
50 51 52	67	INTRODUCTION
53 54	68	The ageing population is rapidly increasing, with individuals aged 65 and older expected to rise from
55 56	69	10% in 2022 to 16% by 2050 [1]. Older adults frequently experience multiple chronic conditions,
57 58 50	70	making them twice as likely to require hospital care compared to younger adults [2]. Medications are
60	71	a primary treatment for many health conditions, and as the prevalence of multiple illnesses

Page 4 of 45

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increases, so does the use of medications, increasing the risk of medication-related complications [3,4]. One in six hospital admissions and one in five readmissions among older patients are medication-related [5,6], most of which are preventable [7]. Care transitions, particularly hospital discharges, pose significant risks to patient safety and is highlighted by the World Health Organization (WHO) as a focus for healthcare improvements [8]. More than one-third of older patients experience adverse drug reactions within eight weeks post-discharge [9], often attributed to poor communication and coordination between hospitals, subsequent healthcare providers, and patients or their informal caregivers [6,10–13]. Most hospitalised older patients experience changes to their medication regimens, which persist after discharge and should be effectively communicated to all individuals involved in their care [14,15]. Relying on written discharge notes and referrals to bridge communication gaps regarding medication changes and follow-up plans has proven unreliable, as this information is often delivered late or of insufficient quality [16–19]. Discharge consultations often lack structure and patient-centeredness, frequently being treated as a checklist item for healthcare professionals (HCPs) to complete before discharge [20–22]. Physicians tend to adopt an authoritative role in medication discussions, which can discourage older patients from actively participating in their medication management [23]. To foster patient involvement, HCPs should act as advocates rather than paternalistic figures [24]. Patient-centred communication at discharge is essential for equipping patients with the knowledge and confidence to manage their medications and self-care [20]. Involving patients in medical decisions is a key component of patient-centred care, leading to improved patient satisfaction and clinical outcomes, such as better glycaemic and blood pressure control [25,26]. However, older patients may be less inclined or unable to participate actively, often due to factors such as cognitive or physical impairments [27]. Many feel insufficiently empowered to engage in discussions about their medications and tend to rely on HCPs, following prescriptions without question [22,28]. Even when discharge information is presented in a structured format, older patients frequently struggle to retain details about their medications [29]. Informal caregivers

3 4	98	can be vital in supporting patient involvement and bridging communication gaps between HCPs and
5 6	99	older patients [12,23].
7 8	100	To address these issues, the research project Improved Medication Communication and
9 10 11	101	Patient Involvement at Care Transitions (IMPACT-care) was initiated [30]. The project began with
12 13	102	exploratory studies of the discharge communication [12,19,22], ultimately leading to the
14 15	103	development of the intervention presented in this protocol.
16 17	104	Aims and objectives
18 19 20	105	The overall aim is to evaluate the effects of a multi-faceted intervention on improving medication-
20 21 22	106	related discharge communication for older hospitalised patients, compared to usual hospital care.
23 24	107	The primary objective is to assess the intervention's impact on the quality of written
25 26	108	medication-related discharge documentation compared to usual hospital care. Secondary objectives
27 28	109	include evaluating the intervention's effect on patients' perceived involvement in discharge
29 30 31	110	medication communication and their confidence in post-discharge medication management, as well
32 33	111	as adherence to medication changes from hospitalisation that persist after discharge, and the need
34 35	112	for unplanned healthcare visits following discharge, all in comparison to usual hospital care.
36 37 38	113	METHODS AND ANALYSIS
39 40 41	114	This protocol was developed and reported in accordance with the Standard protocol items:
42 43	115	recommendations for interventional trials (SPIRIT) 2013 statement [31], the SPIRIT-outcomes 2022
44 45	116	extension [32], and the Template for intervention description and replication (TIDieR) checklist [33].
46 47	117	Study design
48 49 50	118	This prospective intervention study uses a pre-post design (Figure 1). Control patients will be
51 52	119	enrolled first (control period), followed by a training phase during which HCPs in the study wards will
53 54	120	be trained to implement the intervention. Once the HCPs are considered sufficiently trained, the
55 56	121	intervention period will start. Enrolment during both the control and intervention period will stop
57 58 59 60	122	once the target sample size is reached, with patient follow-up continuing for four months post-

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2 3 4	143	of the primary results by accounting for potential seasonal variations and changes in effect over
5 6 7	144	time.
7 8 9	145	Settings
10 11	146	The study is conducted in two surgical wards and one geriatric ward at Uppsala University Hospital in
12 13 14	147	Sweden. Surgical wards mainly handle emergency surgeries, as well as liver-pancreas,
15 16	148	transplantation, oesophagus-stomach, endocrine, and colorectal surgeries. The geriatric ward treats
17 18	149	older patients with complex acute medical and rehabilitation needs. These two clinical specialties
19 20	150	were selected to assess whether the intervention could have an effect across various clinical
21 22 23	151	settings.
24 25 26	152	Study population and recruitment
26 27 28 29 30	153	Patients aged 65 years or older, who manage their own medications either independently or with
	154	support from an informal caregiver, and are admitted to the study wards, are eligible for inclusion.
31 32 22	155	An informal caregiver is defined as an unpaid individual, often a family member, who assists the
33 34	156	patient with daily activities, healthcare communication, and medication management. Exclusion
36 37	157	criteria apply if patients meet any of the pre-determined conditions that would hinder the successful
38 39	158	delivery of the intervention or the reliable collection of outcome data (a detailed list is provided in
40 41	159	Table 1).
42 43	160	The researchers, who are employed by the hospital, screen the admission lists of the study
44 45 46 47 48 49 50	161	wards daily on weekdays to identify eligible patients, who are then asked for inclusion by the
	162	researchers or clinical pharmacists on the ward. Eligibility is primarily determined through the
	163	patient's electronic health records (EHR), with any uncertainties resolved through discussions with
51 52 53	164	HCPs at the study wards. Once identified, patients are informed both verbally and in writing, and
54 55	165	written informed consent is requested. Patients meeting exclusion criteria 10-15 in Table 1 are
56 57 58 59 60	166	excluded at discharge.

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7 During the recruitment of control patients, all patients fulfilling the inclusion and exclusion 8 criteria are invited to participate. During the intervention period, patient inclusion is determined 9 based on the capacity of the pharmacists performing the intervention. The pharmacists' capacity will 0 be evaluated through regular feedback discussions, ensuring that the inclusion process aligns with '1 their workload. If the number of eligible patients exceeds the pharmacists' capacity, the pharmacist, 2 in collaboration with the research team, will determine how many eligible patients can be included. 3 To prioritise which patients to include, a random priority number will be generated for each eligible '4 patient at the study ward level using Microsoft Excel, with those assigned the highest priority '5 included first. 6 Table 1. The inclusion and exclusion criteria in the study. Patients meeting exclusion criteria 1-9 are 7 excluded at the time of hospital admission, while those meeting exclusion criteria 10-15 are 8 excluded at the time of discharge. **Inclusion criteria** 1. 65 years or older. 2. Manages their own medications, either independently or with support from an informal caregiver, prior to inclusion. **Exclusion criteria** Checked at hospital admission 1. Registered in a region outside the study hospital (limited data availability). 2. Admitted from a nursing home (no own medication management prior to admission). 3. Unable to receive information or provide consent independently (due to cognitive impairment or unresponsiveness). 4. Already included in the study. 5. Patient delocalised to the study ward with another medical discipline responsible for the patient's care (formally, no study ward patient). 6. In a late palliative phase prior to inclusion (intervention not suitable). 7. Unable to communicate in Swedish (hindering intervention delivery). Has restricted personal information in the EHR (limited data availability). 8. 9. Admitted for transplantation (intervention not suitable). Checked at hospital discharge 10. Discharged to a nursing home (intervention not suitable). 11. Patient transitions to late palliative phase during the hospitalisation (intervention not suitable). 12. Patient is transferred to a non-study ward and is discharged from there (hindering intervention delivery). 13. The patient dies during the course of the hospital stay (hindering intervention delivery).

1 2		
2 3 4 5 6 7 8 9		<ul> <li>14. No medication changes that last post-discharge during the hospitalisation (intervention not suitable).</li> <li>15. The duration of stay on the study ward is less than 48 working hours (excluding time from 4:00 PM before weekends/public holiday to 8:00 AM the day after a weekend/public holiday) (hindering intervention delivery).</li> </ul>
10 11 12	179	EHR = electronic health records
13 14 15	180	Intervention development
16 17	181	The intervention aims to improve medication communication during the discharge process for older
18 19	182	patients. It was designed by a team of researchers, HCPs, and representatives of patients and
20 21	183	informal caregivers, building on findings from previous research conducted by our group [12,19,34].
22 23 24	184	The inclusion rate, as well as the feasibility of selected intervention components and outcome
25 26	185	measures, were tested in unpublished pilot studies conducted at geriatric and surgical wards at
27 28	186	Uppsala University Hospital, Sweden. These studies involved a total of 106 patients between
29 30	187	September 2023 and May 2024 (Nordin J, Berlin K, Sabouni Y, du Thinh C, et al.: Facilitating patient
31 32 33	188	empowerment at hospital discharge: A pilot study testing the feasibility of the IMPACT-care
34 35	189	intervention, unpublished). Based on the results of these pilot studies, the intervention and study
36 37 38	190	design were refined before advancing to the main trial.
39 40 41	191	Control period (preintervention)
42 43	192	During the control period, care as usual will be provided at the study wards. Clinical pharmacists are
44 45	193	part of the care team at the wards and primarily assist with medication reviews at patient admission
46 47	194	and discharge but are not routinely involved in the discharge communication process. At hospital
48 49 50	195	admission, medication reconciliation is conducted by either a pharmacist or a physician. If needed, a
50 51 52	196	medication review is carried out by the physician, with or without support from a pharmacist. Any
53 54	197	changes to the patients' medication lists are made by wards physicians or nurse practitioners
55 56	198	(specialised nurses at the surgical wards). Oral medication-related communication with the patient
57 58	199	and/or informal caregiver, is typically handled by nurses, physicians, and pharmacists during patient
60	200	consultations. At discharge, hospitals are required to provide a discharge summary to the next

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healthcare provider(s) and a discharge letter intended for the patient [35,36]. Both documents are typically prepared by ward physicians and include details about the hospitalisation, medication changes (along with the rationales for those), planned treatment duration, and follow-up plans. The discharge letter, however, is expected to be written in layman's language. In some cases, these discharge documents are written by a physician who has not met the patient prior to discharge. Pharmacists sporadically assist in preparing these discharge documents, but not in a standardised manner. Additionally, it is standard practice for ward physicians to send specific referrals to the next healthcare provider(s), outlining follow-up requests related to medication changes. In addition, ward physicians conduct an oral discharge consultation, during which the patient is informed about the medication changes and follow-up plans before discharge. While patients receive written information materials with practical information about the wards and surgical procedures at admission, no materials specifically address medications or

213 medication communication at discharge. Inviting informal caregivers to participate in discharge

2 214 consultations and HCPs conducting follow-up calls after discharge occurs in selected cases but is not

215 routine practice.

# 7 216 Implementation period: training of HCPs

The training period will last approximately two months between the control and intervention phases. During this period, HCPs - primarily physicians and pharmacists on the study wards - will undergo training. Training of physicians will focus mainly on the importance of writing discharge documentation and effectively utilising pharmacist support for this process. Training of pharmacists, on the other hand, will focus on implementing the intervention components and understanding the principles of person-centred medication communication at discharge. The training will be delivered through multiple sessions led by the researchers, addressing how the study may impact daily ward processes and how to integrate the intervention components into existing practices. To accommodate new HCPs hired during the study period or those unable to attend the live sessions,

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Additionally, the pharmacists, who play a central role in delivering the intervention components, will
receive a standardised operation procedure document. Other HCPs on the wards, excluding
physicians and pharmacists, will be informed about the study through meetings and information
emails, which will outline how they may be affected by the study. For training purposes, selected
patients will undergo the intervention components without being included in the study. Additionally,
one of the researchers will also regularly visit the study wards to support the HCPs in implementing
the intervention components during this phase.

234 Intervention period

The intervention is designed to be implemented on hospital wards by clinical pharmacists who are already part of the patient care team. Each of the study wards in our study has a full-time equivalent clinical pharmacist present during weekday office hours, with a continuous presence established over the past 15 years before the study began. The pharmacists involved have varying levels of experience, from limited to more extensive, some of whom have a one-year full-time postgraduate MSc in clinical pharmacy. All relevant details about the completed intervention components and any other actions taken by the pharmacist will be documented as usual in the patient's EHR. The IMPACT-care intervention consists of the following four components (Figure 2): 1. Information package provided to patients and/or informal caregivers. In our pre-study [22], it was identified that medication-related discharge communication is not

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in our pre-study [22], it was identified that medication-related discharge communication is not
tailored to support patients' self-care needs post-discharge. Additionally, patients were unprepared
for medication-related consultations prior to discharge. To address these challenges, the research
team, inspired by a similar intervention component developed in the UK [37], designed an
information package consisting of a patient booklet (Supplementary material I) and a 3-minute
supplementary video, with input from clinical pharmacists at Uppsala university hospital and a panel
of public representatives.

The booklet is designed to inform, prepare, and engage patients and/or their informal
 caregiver in medication communication at discharge and self-care after returning home. It is

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organised into four sections: 1. Hospitalisation course, 2. Medications, 3. Discharge, and 4. Advice on self-care. The first two sections feature a question prompt list [38], a set of discussion points intended to guide conversations with HCPs and encourage patients to actively participate in their care. The use of questions prompt list has been found to enhance patient participation in medication-related communication [39,40]. The third section contains a checklist of essential points for patients to review with HCPs to help confirm they have sufficient knowledge before leaving the hospital. The final section provides practical advice on seeking medication and general healthcare support after returning home.

The supplementary video highlights the importance of patient engagement in their own care and demonstrates how to use the booklet effectively as a supporting tool. Patients will receive the booklet in printed format at admission to the study ward, and the video will be shown bedside on a tablet. These materials will be accompanied by an oral consultation with a pharmacist, who will explain the content and guide the patient on how to use the booklet effectively. Both the booklet and video will also be available online. If the patient wishes, the pharmacist will provide the patient's informal caregiver access to the information package. This can be done in person if the caregiver is present at the ward or remotely via phone, guiding them on how to access the materials online.

269 2. Preparation of medication-related discharge documentation.

Incompleteness and poor quality of medication-related discharge communication from hospitals is a common problem [41,42], making it difficult for subsequent HCPs to trust this information [12,17,43]. Pharmacist involvement can significantly improve the completeness and quality of such communication [41,42]. Consequently, in our study, the pharmacist will review relevant parts of the patient's EHR and medication list prior to discharge to identify any lasting medication changes made during the hospitalisation. The pharmacist will collaborate with the discharging physician to reconcile follow-up plans for these changes. All medication changes, including reasons for the adjustments (when known), planned treatment duration, follow-up plans, and the ward's phone number for any post-discharge inquiries from the patient, will be documented in a standardised 

1 2		
3 4	279	manner in the EHR by the pharmacist. This documentation will form the basis for detailing
5 6	280	medication changes and follow-up plans in the patient's discharge letter and the discharge summary
7 8 0	281	intended for the next healthcare provider, both of which are written by a ward physician.
9 10 11	282	3. Facilitation of discharge communication.
12 13	283	To increase the likelihood that patients and their informal caregiver remember and use the booklet
14 15	284	provided to them during intervention component 1, the pharmacist will consult the patient as the
16 17	285	discharge date approaches. The consultation will include a review of the booklet's content and a
18 19 20	286	reminder to use it. If the patient wishes, the pharmacist will also contact the patient's informal
20 21 22	287	caregiver, either by phone or face-to-face, depending on the situation, to review the booklet and
23 24	288	remind them to use it.
25 26	289	Informal caregivers are considered as valuable support in helping patients recall information
27 28 20	290	and manage self-care after returning home [12]. However, they are often involved in a limited way in
29 30 31	291	medication-related discharge communication by HCPs [22,44]. To address this gap, the pharmacist in
32 33	292	our study will arrange for an informal caregiver to attend the discharge consultation with the
34 35	293	physician, if the patient so wishes. The pharmacist will contact the informal caregiver by phone once
36 37	294	the discharge date is confirmed - no later than the morning of discharge - and invite them to
38 39 40	295	participate in the consultation. Participation can be in person, by phone, or via video call depending
41 42	296	on their availability. The pharmacist will then inform the discharging physician that the patient has
43 44	297	requested their informal caregiver's involvement in the discharge consultation.
45 46 47	298	4. Follow-up call to patients or their informal caregiver.
47 48 49	299	The timing of medication-related discharge communication often occurs at a suboptimal moment for
50 51	300	patients, making it difficult for them to retain and recall the information after returning home [22].
52 53	301	Incorporating intervention components both during hospitalisation and after discharge can help
54 55	302	support medication continuity in older patients and bridge transitions [45]. Telephone follow-ups, in
50 57 58	303	particular, have shown promise in enhancing this support [45]. Therefore, in our study, patients or
59 60	304	their informal caregiver (based on the patient's preference) will be offered a follow-up call with a

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3 4	305	clinical pharmacist post-discharge. If requested, the appointment for this call will be scheduled in
5 6	306	consultation with the patient/informal caregiver, between 3-7 days after discharge, depending on
7 8	307	the patient's availability. The pharmacist will then contact the patient/informal caregiver at the
9 10 11	308	agreed time. During the call, the pharmacist will start by addressing any questions the
12 13	309	patient/informal caregiver may have, providing direct answers or referring inquiries to the
14 15	310	appropriate HCP as needed. Following this, the pharmacist will review the medication-related
16 17	311	discharge information, focusing on the updated medication list and details outlined in the discharge
18 19 20	312	letter, including medication changes, reasons for the adjustments, planned treatment duration, and
20 21 22	313	follow-up plans. Additionally, the pharmacist will remind the patient of the advice on when and how
23 24	314	to seek care, as presented in the booklet provided during intervention component 1.
25 26		Admission to study ward Hospital discharge Returned home
27 28 29 30 31		IMPACT-care intervention (components conducted by clinical pharmacists)       1) Information package provided to patients*       2) Preparation of medication-related discharge documentation.
32	315	3) Facilitation of discharge communication.
33 34	316 317	* Based on the patient's preference, this may include their informal caregiver. IMPACT-care = improved medication communication and patient involvement at care transitions
35 36	218	<b>Figure 2</b> Overview of the IMPACT care intervention comprising four intervention components
37 38	319	implemented during patient hospitalisation and post-discharge.
39 40	320	Outcomes
41 42	321	All outcomes will be assessed for participants from both the control and the intervention group
43 44	322	(Table 2).
45 46 47	323	Primary outcome
48 49	324	The improvement in the quality of medication-related discharge documentation will be the primary
50 51	325	outcome, assessed using the average score from the Complete Medication Documentation at
52 53	326	Discharge Measure (CMDD-M) (Supplementary material II). This point-based instrument, ranging
54 55 56	327	from 0 to 9 points, is based on Swedish legislation [36] outlining the requirements for written
57 58	328	medication-related discharge documentation. The CMDD-M comprises five items, each scored from
59 60	329	0-1 or 0-2 points depending on the criteria. It evaluates the completeness and quality of medication-

Page 15 of 45

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2 3 4	330	related discharge documents for individual hospital discharges, including the patient's discharge
5 6	331	letter, the discharge summary intended for the next healthcare provider, and the presence of a
7 8	332	follow-up request to bridge the gaps post-discharge. Improving the quality of discharge
9 10 11	333	documentation is critical for ensuring continuity of care and patient safety during transitions of care
12 13	334	[17]. Poor-quality documentation has been associated with medication errors [11], non-adherence
14 15	335	[46], and avoidable need for medical care after discharge [47,48]. By focusing the primary outcome
16 17	336	on this domain, the trial aims to address an important gap in care that impacts patient outcomes.
18 19 20	337	Secondary outcomes
20 21 22	338	• The proportion of patients with complete medication-related discharge documentation. This
23 24	339	will be assessed using the CMDD-M to determine the prevalence of patients achieving the
25 26	340	maximum score of 9 points.
27 28 20	341	Improvement in patients' perceptions of involvement in discharge medication communication
29 30 31	342	and their confidence in post-discharge medication management. This will be assessed by the
32 33	343	average score by the Patient Involvement in Medication Communication at Hospital discharge
34 35	344	Questionnaire (PIMCH-Q) (Supplementary material III). It consists of eight statements rated on a
36 37 38	345	four-point Likert scale. It is designed with three dimensions: perception of knowledge,
39 40 41 42	346	participation, and confidence, and aims to measure patients' perceived involvement in
	347	medication communication during hospitalisation and their confidence in managing
43 44	348	medications after discharge. The questionnaire will be sent to patients one week post-
45 46 47	349	discharge.
47 48 49	350	• Adherence to medication changes made during hospitalisation that persist post-discharge. This
50 51	351	will be assessed by measuring the number of instances of non-adherence. Non-adherence to a
52 53	352	medication change is defined as follows:
54 55 56	353	a. New or modified medications: A medication initiated or modified during
57 58	354	hospitalisation (i.e., changes in strength, dose, or formulation) that is not dispensed
59 60	355	from a community pharmacy within 14 days post-discharge This applies regardless

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2 3 4	356	of whether the reason is a missing prescription or the patient not filling the
5 6	357	prescription. Changes in strength or dose are included only when they create a
7 8	358	safety risk for the patient if the previous prescription is used (e.g., reducing the dose
9 10 11	359	of a tablet from 10 mg once daily to 2.5 mg once daily, which would require the
12 13	360	patient to split the same tablet twice to get the correct dose, a practice considered
14 15	361	unsafe).
16 17	362	b. Discontinued medications: A medication discontinued during hospitalisation (or with
18 19 20	363	altered strength or formulation) that is erroneously dispensed using a previous
20 21 22	364	prescription within 120 days post-discharge.
23 24	365	The rationale for collecting data up to 120 days post-discharge is based on standard
25 26	366	pharmacy practices in Sweden, where medications are typically dispensed for a 90-
27 28 20	367	day (three-month) supply at a time. Patients may have leftover supplies of
29 30 31	368	discontinued medications at home and continue using them. However, if these
32 33	369	medications are not refilled at a pharmacy within 120 days, the patient is considered
34 35	370	adherent to the discontinuation.
36 37	371	• The proportion of patients who are fully adherent to the medication changes made during
38 39 40	372	hospitalisation that persist post-discharge. This will be assessed by determining the
41 42	373	prevalence of patients who have no instances of non-adherence as described above.
43 44	374	Unplanned healthcare visits post-discharge. This will be assessed using the following outcome
45 46 47	375	measures:
47 48 49	376	• The prevalence of patients with at least one unplanned hospital revisit (a composite
50 51	377	measure of unplanned readmissions and emergency department visits) at 7, 30, and
52 53	378	90 days post-discharge.
54 55	379	• The prevalence of patients with at least one unplanned readmission at 7, 30, and 90
50 57 58	380	days post-discharge.
59 60		

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3 4	381	0	The prevalence of patients with at least one emergency department visit (not
5 6	382		followed by admission) at 7, 30, and 90 days post-discharge.
7 8 0	383	0	The time to the first unplanned hospital revisit within 90 days.
9 10 11	384	0	The time to the first unplanned readmission within 90 days.
12 13	385	0	The time to the first emergency department visit within 90 days.
14 15	386	0	The prevalence of patients with at least one potentially medication-related hospital
16 17 19	387		readmission at 7, 30, and 90 days post-discharge, assessed using the validated AT-
19 20	388		HARM10 tool [49,50].

# **Table 2.** Timeline and overview of the scheduled data collection for both the control andintervention group participants.

	Admission	Discharge			Follow	-up	
Time points (day)	-1α	0	7	14	30	90	120
Study inclusion	6	),					
Eligibility screening	x	x					
Informed consent	x	12					
Demographic data	x	×					
Outcome measures							
CMDD-M <sup>β</sup>		x					
ΡΙΜϹΗ-Q <sup>γ</sup>			x				
Adherence to medication changes				х			х
Hospital revisits			x		х	x	
Hospital readmissions			x		х	х	

2			-	-					
3 4 5		Emergency department visits			x		х	х	
6 7 8		Medication-related readmissions			x		х	х	
9	201	$\alpha$ Time point at which the patient is adm	I itted to the stu	l dy ward					
10	303	$\beta$ CMDD M a point based instrument us	ing data from t	uy watu. ha nationt's alastr	onic ho	alth r	acordo		
11 12	202	V DIMCLI O a questionnaire to nationte r		ne patient s elections			dicebor	ro modi	ation
13	201	sommunication and their confidence in	neasuring their	modication manage	onverne	entin	uischar	ge mean	Lation
14	394	communication and their confidence in	Jost-uischarge		ement.				
15	395	CMDD-M = complete medication docum	entation at dis	charge measure, P	ІМСН-С	<b>)</b> = pa	tient inv	volveme	nt in
16 17	396	medication communication at hospital d	ischarge quest	ionnaire					
18 19	397	Data collection							
20 21 22	398	Screening of patients at the study wa	ards will be pe	erformed by the r	esearc	hers,	who a	re emp	loyed by
22 23 24	399	the hospital. This will be done using i	nformation fr	om the EHR and,	if any	uncla	arities o	occur, t	nrough
25 26	400	contact with the ward HCPs. The res	earchers will i	nvite eligible pat	ients to	o part	ticipate	and pa	atients
27 28	401	willing to participate will be asked to	sign informe	d consent. Data v	vill be o	collec	cted fro	m all	
29 30	402	participants, regardless of their adhe	rence to the i	ntervention, pro	vided t	hey c	do not v	withdra	w their
32 33	403	consent to participate in the study. T	his approach	ensures complet	e follov	w-up	data fo	or inclus	sion in
34 35	404	the intention-to-treat (ITT) analysis.	The data colle	ction will procee	d in se	veral	steps (	Table 2	) and
36 37	405	will be conducted by researchers in t	he research t	eam and trained	resear	ch as	sistants	s. To en	sure
38 39 40	406	uniformity of data collection, standa	rd operating p	procedures have	been d	levelo	oped. D	ata will	be
40 41 42	407	pseudonymised and transferred to ca	ase report for	ms (CRFs) in an e	lectror	nic da	ita capt	ure sys	tem,
43 44	408	REDCap [51]. All data processing and	analysis will	be based on the o	data in	these	e CRFs	and wil	l be
45 46	409	shared and discussed in pseudonymi	sed form. Any	r forms and elect	ronic fi	iles th	nat reve	eal rese	arch
47 48 49	410	data of an individual patient will be s	tored in a loc	ked archive at th	e hospi	ital p	harmad	cy. Acce	ess to
50 51	411	the final trial dataset will be restricte	d to the mem	bers of the resea	arch tea	am.			
52 53	412	Demographic data							
54 55	413	Demographic data collected from the	e EHR will incl	ude age, gender,	renal	funct	ion, ad	mission	and
56 57 58	414	discharge dates, medication treatme	nt at admissio	on and discharge	, wheth	her th	ne patie	ent has	support
59 60	415	by automatic dose-dispensation of m	edications, d	isease diagnoses	prima	ıry dia	agnosis	for adr	nission,

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Page 19 of 45

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home care support, whether the patient lives alone, and the number of emergency department visits and hospital admissions in the past year. Information about patients' education level will be gathered through the researchers asking the patients at inclusion.

Completeness and quality of discharge documentation

After patient discharge, the discharge letter, discharge summary, and referrals to next healthcare providers for follow up will be extracted from the EHR for scoring according to CMDD-M. Although the responsiveness of the CMDD-M has not yet been evaluated, the instrument was specifically developed to be used in clinical settings in Sweden. Initial validation demonstrated that the instrument is feasible for use in our setting. Inter-rater reliability was assessed using Cohen's weighted kappa with both linear (Kw linear) and quadratic (Kw quadratic) weights. The Kw linear for the comparison between two clinical pharmacists was 0.92, while the comparison between their consensus and a geriatrician yielded a Kw linear of 0.64. Similarly, the Kw quadratic was 0.97 for the comparison between the pharmacists and 0.80 for the comparison between their consensus and the geriatrician. These findings indicate moderate to almost perfect reliability between raters and suggest that the CMDD-M instrument provides robust reliability in assessing the quality and completeness of medication-related discharge documentation in older hospitalised patients (Bertilsson E, Cam H, Östman V, Franzon K, Gillespie U: Development and validation of an instrument to assess quality and completeness of medication-related discharge documentation, submitted for publication). Given its design and focus on aspects directly relevant to our intervention, we anticipate it to effectively capture meaningful changes within our study sample. To ensure objectivity, the assessment using the CMDD-M will be conducted by the researchers in a blinded manner. Data extracted from the EHR will be masked to prevent assessors from linking patients to specific time periods, ensuring they remain unaware whether the patient belongs to the control or intervention group. Patients' experience

#### Page 20 of 45

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The PIMCH-Q will be sent to patients by mail or email, depending on their preferences, one week after the discharge date. The patients are asked to answer the questionnaire as soon as possible. If no response is received within 10 days, the research team will follow-up with a reminder via email or phone. During the reminder call, patients will also be offered the option to respond by phone if preferred. The PIMCH-Q was selected for this study because, to the best of our knowledge, no existing instrument adequately captures medication-related patient experiences during hospital discharge. While its responsiveness has not yet been validated, the tool was specifically designed to assess patient involvement in medication communication and confidence in medication management post-discharge, which are core aspects of this study. Despite the need for further validation, the PIMCH-Q remains the most suitable tool for achieving our study objectives. Adherence to medication changes Data about the lasting medication changes made and prescribed during hospitalisation will be gathered from the EHR. Information on medications dispensed from pharmacies for each patient 120 days post-discharge will be obtained from the Swedish National Board of Health and Welfare's medication register. This register contains data on all medications dispensed from community pharmacies in Sweden on a patient level. The extracted data will include the medication name, the anatomical therapeutic chemical code, strength, prescribed quantity, collected quantity, prescription date, collection date, prescriber's profession, and workplace. The assessment of the number of instances of non-adherence will be conducted by the researchers. Healthcare Utilisation Unplanned hospital revisits, readmissions, emergency department visits, and time to these hospital revisits within 90 days will be extracted from the EHR. The assessment whether the hospital readmissions were potentially medication-related will be conducted retrospectively with the AT-HARM10 tool [49] through information from the EHR. The assessment will be conducted by one clinical pharmacist and one physician who are not otherwise involved in the study. Initially, they will

2		
3 4	466	independently evaluate each case, followed by a discussion to reach consensus on cases where their
5 6	467	initial assessment (e.g., whether a readmission is potentially medication-related) differed.
/ 8	468	Process evaluation
9 10 11	469	A mixed-method approach, combining both quantitative and qualitative methods, will be used for a
12 13	470	process evaluation to assess adherence to the study protocol and explore the implementation of the
14 15	471	intervention. The evaluation will be guided by the framework for process evaluation developed by
16 17	472	the UK Medical Research Council [52].
18 19 20	473	Quantitative Process Evaluation
21 22	474	The quantitative process evaluation will include all patients in the study to gain insight into the
23 24	475	extent of intervention implementation, the degree to which some intervention components may
25 26	476	already be in place during the control period, and adherence to the study protocol. The following
27 28 29	477	data will be collected from the EHR:
30 31	478	• The proportion of control and intervention patients who received a discharge letter.
32 33	479	• The proportion of control and intervention patients for whom the clinical pharmacist
34 35	480	prepared a medication discharge documentation.
36 37 38	481	• The proportion of intervention patients who received the information package.
39 40	482	• The proportion of control and intervention patients for whom the physician used the
41 42	483	medication discharge documentation prepared by the pharmacist. This is measured by
43 44	484	manually comparing the content of the prepared medication discharge documentation by
45 46 47	485	the pharmacist with the actual medication summary in the discharge letter and final note
47 48 49	486	written by the physician.
50 51	487	• The proportion of intervention patients who are reminded by the pharmacist to review the
52 53	488	information package.
54 55	489	• The proportion of intervention patients who wish to have an informal caregiver present at
50 57 58	490	the discharge consultation, and the proportion of those cases where the pharmacists
59 60	491	contacts the informal caregiver to be present.

Page 22 of 45

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3 4	492	• The proportion of intervention patients who wish to have a follow-up call with a pharmacist
5 6	493	after discharge, received the follow-up call, and whether it led to any pharmacist
7 8	494	intervention, including details of the intervention.
9 10 11	495	Additional data collection methods:
12 13	496	• The proportion of all employed physicians and clinical pharmacists at the study wards who
14 15	497	attend the training sessions. All HCPs attending the training sessions will be registered by the
16 17	498	researchers. Data on HCPs who complete digital training sessions will be extracted from the
18 19 20	499	digital training platform.
20 21 22	500	• The response rate of PIMCH-Q, along with the distribution method (paper, telephone, or
23 24	501	digital). This will be extracted from REDCap.
25 26	502	• The proportion of control and intervention patients who recall having a discharge
27 28 20	503	consultation, whether they wished to have an informal caregiver present, whether an
29 30 31	504	informal caregiver was actually present, their desire for a follow-up call, and whether they
32 33	505	received one. For control patients, these questions aim to determine the extent to which
34 35	506	intervention components are performed as part of standard care. Additionally, for
36 37	507	intervention patients, the proportion of patients who recall receiving the information
38 39 40	508	package (intervention component 1) and their perception of it will be asked. These questions
41 42	509	will be sent to patients alongside the PIMCH-Q.
43 44	510	• The duration of each follow-up call conducted by the pharmacist (intervention component
45 46	511	4). This will be recorded by the pharmacists.
47 48 49	512	Qualitative Process Evaluation
50 51	513	To gain a deeper understanding of how the intervention was implemented, a qualitative process
52 53	514	evaluation involving HCP and patient interviews is planned to be conducted immediately after the
54 55	515	last patient is discharged in the study. The detailed planning for this evaluation has not yet been
56 57 58	516	finalised.
59 60	517	Sample size calculation

Page 23 of 45

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518	The sample size calculation is based on the primary outcome, which is the quality of medication-
519	related discharge documentation measured using the CMDD-M. The intervention will be deemed
520	successful if the average score is significantly higher in the intervention group compared to the
521	control group. For the calculation, we assumed an evenly distributed sample between the two
522	groups and set the target difference in CMDD-M scores at one point. This conservative target was
523	chosen as it represents the smallest measurable step in the instrument. In practice, a one-point
524	difference may indicate the inclusion of medication changes in the discharge letter or discharge
525	summary. Such an improvement reflects a critical enhancement in quality, with important
526	implications for patient safety and continuity of care. Data from the pilot studies indicated that the
527	baseline value for CMDD-M was 3.9 (SD 2.6) (Nordin J, Berlin K, Sabouni Y, du Thinh C, et al.:
528	Facilitating patient empowerment at hospital discharge: A pilot study testing the feasibility of the
529	IMPACT-care intervention, unpublished). Due to the maximum score limit in CMDD-M, the variance
530	in scores is expected to differ between the control and intervention periods. This difference arises as
531	scores may cluster near the upper limit, particularly in the intervention period where improved
532	performance is anticipated, potentially leading to reduced variability compared to the control
533	period. A two-sided t-test with Welch's correction for degrees of freedom (to account for the
534	variance difference between groups) was used. A power of 0.8 was considered sufficient to detect
535	an increase, with a 5% two-sided significance level. Based on these assumptions, a sample size of
536	115 patients per group, for a total of 230 patients, is required.
537	Additionally, a permutation test using the Mann-Whitney U-test was performed to assess
538	the robustness of the t-test, yielding similar results.
529	Statistical analysis
555	

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A full statistical analysis plan (SAP) will be finalised prior to any analyses. Statisticians from the
Uppsala Clinical Research Center (UCR) will oversee the statistical analyses. The primary analysis will
follow the ITT principle, including all included patients in their assigned groups, regardless of

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Page 24 of 45

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protocol adherence. Additional analyses will include per-protocol (PP) analyses, i.e. excluding
patients with protocol violations.

545Descriptive analyses of the study population will be performed, with continuous data546presented as mean ± standard deviation (SD) for normally distributed variables or as median and547range for non-normally distributed variables. Categorical variables will be reported as frequencies548and percentages. All outcomes will be summarised by study group, overall and by ward,549descriptively. Comparative statistics between study groups will be conducted, with all statistical tests550being two-sided and a p-value less than 0.05 considered statistically significant.551Models for analysing primary and secondary outcomes will include both unadjusted and fully552adjusted analyses. Adjustments will account for age, gender, education level, ward type (geriatric or553surgical), number of medication changes persisting post-discharge, number of medications at554discharge, support by automatic dose-dispensation of medications, and duration of hospitalisation.555Effect estimates, including odds ratios, hazard ratios, and rate ratios will be presented with 95 % Cl556and p-values.557Primary outcome analysis

558 Linear regression models with robust standard errors will be used to estimate the effect of the

<sup>9</sup> 559 treatment groups on the CMDD-M score. The results will be reported as effect estimates. A

560 sensitivity analysis of the primary outcome will be performed using a permutation-based Wilcoxon

<sup>13</sup> 561 non-parametric test.

6 562 Secondary outcome analysis

Logistic regression will be used to analyse the prevalence of patients achieving the maximum score (9 points) on the CMDD-M, with results presented as odds ratios. The PIMCH-Q score will be analysed using linear regression models, evaluating the three dimensions both separately and in total. Differences in the number of instances of non-adherence to medication changes persisting post-discharge will be assessed using quasi-Poisson regression models, with results reported as rate

1 ว		
2 3 4	568	rations. Logistic regression models will be used to analyse the prevalence of patients who are fully
5 6	569	adherent to medication changes persisting post-discharge, with results reported as odds ratio.
/ 8 0	570	The difference in the prevalence of patients with unplanned hospital revisits, unplanned
9 10 11	571	readmissions, emergency department visits and medication-related readmissions at 7, 30, and 90
12 13	572	days post-discharge will be compared with logistic regression models, with results presented as odds
14 15	573	ratios. Time to first unplanned hospital revisit, time to first unplanned readmission, and time to first
16 17 19	574	emergency department visit will be analysed using Cox proportional hazards models. Patients who
10 19 20	575	do not experience the event by the end of the study period or are lost to follow-up will be censored
21 22	576	at their last known follow-up time, while patients who die before experiencing the event will be
23 24	577	censored at the time of death. Results will be reported as hazard ratios.
25 26 27	578	Exploratory analyses
27 28 29	579	To analyse data collected at multiple regular intervals before and after the intervention, an ITS-
30 31 32	580	analysis will be performed. A linear regression model will be estimated as follows:
33 34	581	Y=b <sub>0</sub> +b <sub>1</sub> T+b <sub>2</sub> I+e
35 36	582	Where:
37 38 20	583	Y: Outcome variable (CMDD-M score, prevalence of patients achieving the maximum score on
39 40 41	584	CMDD-M, PIMCH-Q score, or the number of non-adherence instances to medication changes
42 43	585	persisting post-discharge)
44 45	586	$b_0$ : Intercept, representing the expected value of the outcome variable (Y) at baseline (T = 0 and I =
46 47 48	587	0).
48 49 50	588	$b_1$ : Time effect, indicating the change of the outcome variable (Y) for each day passed, regardless of
50 51 52	589	the intervention.
53 54	590	T: Time in days passed from the start of the study, capturing natural changes in the outcome over
55 56	591	time.
57 58 59	592	$b_2$ : Intervention effect, representing the difference in the outcome variable (Y) between pre-
60	593	intervention ( $I = 0$ ) and post-intervention ( $I = 1$ ) periods, after accounting for time trends.

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Page 26 of 45

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594	I: Dummy variable indicating whether the observation was collected before (0) or after (1)
595	intervention, enabling comparison outcomes before and after the intervention.
596	e: Error term, capturing random noise or unexplained variation in the outcome variable (Y).
597	This model will allow us to investigate whether there is an immediate effect following the
598	intervention. Results will be presented as regression estimates with 95% CI and p-values. This
599	analysis will be conducted for the following outcomes: CMDD-M score, prevalence of patients
600	achieving the maximum score on CMDD-M, PIMCH-Q score (the three dimensions separately and
601	total score), the number of non-adherence instances to medication changes persisting post-
602	discharge, and prevalence of patients who are fully adherent to medication changes.
603	Process evaluation
604	Quantitative data from the process evaluation will be presented with descriptive statistics by study
605	group and in total. No formal statistical tests will be performed.
606	Public and patient involvement
607	Our research team includes two public representatives: CB, who holds political duties advocating fo
608	patients, and UE, who serves as the chairperson of an association representing relatives of older
609	patients. Both have actively contributed to the design and development of this intervention study.
610	Additionally, we engaged a broader panel of five public representatives, all of whom are either
611	members of senior associations or have experience with hospitalised care. This panel reviewed and
612	provided suggestions to improve the wording of the consent form for study inclusion and the
613	
	PIMCH-Q sent to patients. They also played a key role in developing the information package for
614	PIMCH-Q sent to patients. They also played a key role in developing the information package for intervention component 1, offering feedback on its design and content.
614 615	PIMCH-Q sent to patients. They also played a key role in developing the information package for intervention component 1, offering feedback on its design and content.
614 615 616	<ul> <li>PIMCH-Q sent to patients. They also played a key role in developing the information package for intervention component 1, offering feedback on its design and content.</li> <li>ETHICS AND DISSEMINATION</li> <li>This study involves human subjects and the handling of sensitive personal health data. Although,</li> </ul>
614 615 616 617	<ul> <li>PIMCH-Q sent to patients. They also played a key role in developing the information package for intervention component 1, offering feedback on its design and content.</li> <li>ETHICS AND DISSEMINATION</li> <li>This study involves human subjects and the handling of sensitive personal health data. Although, there is a risk associated with collecting sensitive patient data, we will minimise these risks by</li> </ul>

adhering to the General Data Protection Regulation (GDPR) [53], and the Declaration of Helsinki [54]. 

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All participants will provide written informed consent before participation. The stu s been approved by the Ethical Review Authority in Sweden (registration no. 2023-03518d 2024-04079-02).

The aim of this intervention study is to evaluate whether a novel approach edication-related discharge communication can improve patient care. The comparator chose this study is the current standard discharge process (care as usual), selected because it reflects outine practices patients experience in the study settings and provides a relevant baseline valuating the intervention's impact. During the intervention period, in addition to the usual of he intervention focuses on enhancing the quality of medication-related communicatic discharge, involving patients and/or caregivers in discussions with HCPs, and offering a follow all after discharge to reinforce information retention. During the clinical pharmacists' follow phone calls with patients in the intervention group, new issues may be identified that need att n. If the pharmacist making the call is not the appropriate person to handle these issues, th ll consult with another suitable HCP to ensure the problem is addressed. We plan to publish the results of the main trial and any sub-studies in inter nal peer-reviewed open-access journals, as well as present them at national and internation nferences. The trial is expected to result in multiple published manuscripts, contribute to at le ne PhD thesis, and support improved implementation of current Swedish regulations for m tion-related discharge communication [36]. REFERENCES United Nations Department of Economic and Social Affairs, Population Divisio orld 1. Population Prospects 2022: Summary of Results [Internet]. United Nations; 20 vailable from: https://www.un.org/development/desa/pd/sites/www.un.org.development.de od/files/wpp 2022\_summary\_of\_results.pdf 2. Centers for Disease Control and Prevention. Persons with hospital stays in the past year, by

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  - 883 The authors declare no competing interests.

for open teries only
# Dina läkemedel: från sjukhuset till hemmet

Ett stöd under sjukhusvistelsen för att förbereda dig inför att komma hem





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# Hur denna broschyr kan användas

När man är inlagd på sjukhus händer det många saker och det kan vara så att man inte förstår eller känner sig bekväm med allt som sker.

Denna informationsbroschyr är tänkt som ett stöd för dig och dina eventuella närstående för att få mer kunskap om din vård under tiden på sjukhuset och när du kommer hem.

Den är indelad i fyra avsnitt och innehåller information och förslag på punkter att diskutera med vårdpersonalen eller dina eventuella närstående.

Du kan markera de punkter du skulle vilja diskutera med vårdpersonalen. Du kan också anteckna egna frågor som du vill ta upp.

## Min sjukhusvistelse

# 2 Mina läkemedel

**3** Inför att komma hem (utskrivning)

# Råd när jag är hemma

Scanna med en mobilkamera för informationsfilm





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# Min sjukhusvistelse

För att du ska kunna sköta om din egen vård och läkemedelsbehandling när du kommer hem underlättar det om du har kunskap om det som har hänt på sjukhuset. Det kan du få genom att:

- Prata med vårdpersonalen om det som händer och om det är något du undrar över.
- Be om att få vara med i diskussionerna kring din vård och läkemedelsbehandling.

#### Punkter jag skulle vilja diskutera

Markera vad du skulle vilja diskutera och/eller skriv ner andra frågor.

- · Vad har jag behandlats för på sjukhuset?
- Vad är planen för min vård på sjukhuset?
- Vad är planen för min vård efter att jag kommer hem?
- Vad för hjälp och stöd kan jag få när jag kommer hem?
- Hur kan mina eventuella närstående hjälpa mig?

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Det är vanligt att det görs ändringar i din läkemedelsbehandling när du är på sjukhus och det kan vara svårt att hålla sig uppdaterad.

Du kan fråga vårdpersonalen om dina läkemedel. Du kan också diskutera hur du ska ta dem hemma och om det är något du behöver öva på.

#### Punkter jag skulle vilja diskutera

Markera vad du skulle vilja diskutera och/eller skriv ner andra frågor.

- Vilka läkemedel tar jag och varför?
- Hur och när ska jag ta mina läkemedel och är det något särskilt jag ska tänka på?
- Vilka ändringar i min läkemedelsbehandling är gjorda på sjukhuset och varför?
- Vilken effekt kan jag förvänta mig av mina nya läkemedel?
- Vilka biverkningar ska jag vara uppmärksam på?
- Vart ska jag vända mig om jag har frågor eller om jag upplever att jag inte mår bra av mina läkemedel?
- Kan jag få öva på att ta mina läkemedel (t.ex. sprutor eller inhalatorer) medan jag är på sjukhuset?
- Vilket stöd finns om jag skulle behöva hjälp med mina läkemedel hemma?

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Utskrivning innebär att det är dags för dig att lämna sjukhuset, och då kan det vara mycket information som du och dina eventuella närstående ska få och att diskutera. Informationen ska göra så att du vet vad du kan förvänta dig när du kommer hem och hur du kan få hjälp om du behöver det.

#### Det här är information du har rätt att få innan du lämnar sjukhuset:

- Utskrivningssamtal: ett samtal du kommer ha med en läkare för att gå igenom det som hänt under tiden på sjukhuset och planen framåt. Det kan vara bra om en eventuell närstående är med vid samtalet.
- Utskrivningsmeddelande: skriftlig information om det som har hänt under tiden på sjukhuset, vilka förändringar som har gjorts av dina läkemedel, samt vad planen är för nästa steg i din vård. Läs och spara utskrivningsmeddelandet och visa det för dina eventuella närstående.
  - Läkemedelslista: en skriftlig lista med de läkemedel som du ska fortsätta ta när du kommer hem. Använd denna och släng dina tidigare listor.



Stäm av checklistan med vårdpersonalen för att säkerställa att allt är i ordning innan du lämnar sjukhuset.

Jag vet vilka symtom jag ska vara uppmärksam på.
Jag vet vilka läkemedel jag ska ta när jag kommer hem och hur jag ska ta dem.
Jag vet vart jag ska vända mig för att få nya recept på mina läkemedel.
Jag vet vart jag kan vända mig om jag mår sämre eller har frågor om mina läkemedel.
Jag vet hur hemtjänst och/eller hemsjukvård kommer att hjälpa mig med mina läkemedel (om aktuellt).
Jag vet vilken uppföljande kontakt med vården som är planerad för mig.
Jag har fått mitt utskrivningsmeddelande.
Jag har fått min nya läkemedelslista.
Jag har haft ett utskrivningssamtal med läkare.
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# Råd när du är hemma

# Mina läkemedel

- Om du framöver har frågor om dina läkemedel kan du kontakta ett apotek eller den vårdcentral eller mottagning du tillhör.
- Om du inte kommer ihåg vilka ändringar som gjorts med dina läkemedel på sjukhuset kan du titta i utskrivningsmeddelandet och läkemedelslistan.
- Utskrivningsmeddelandet och l\u00e4kemedelslistan du fick fr\u00e4n sjukhuset finns även i din journal på 1177.se. Du kan också kontakta din vårdcentral för att få ut informationen igen.
- Använd alltid den senaste läkemedelslistan som du fått från sjukhuset eller din vårdcentral. Listan som du kan få från apoteket innehåller inte alltid de ändringar som har gjorts, så du ska inte följa den.
  - De läkemedel du inte längre använder ska lämnas in på ett apotek.
  - Kom ihåg att förnya dina recept i god tid.

# Sök hjälp om du blir sämre

- Du kan känna kvarvarande symtom när du just kommit hem. Kontakta din vårdcentral eller ring sjukvårdsrådgivningen (1177) om symtomen inte försvinner, blir värre eller om du får andra symtom.
- Ring 112 eller åk in till närmaste akutmottagning om du är rädd för att ha drabbats av något allvarligt eller livshotande.
  - For peer review only http://bmjopen.bmj.com/site/about/guidelines.xhtml

#### Anteckningssida For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

### Complete Medication Documentation at Discharge Measure (CMDD-M)

(Unofficial English version, translated from Swedish)

Item	Discharge letter (intended for the patient)	Points
1	The discharge letter includes a description of medication changes	0-1
	- 0 points: No	
	- 1 point: Yes	
2	<b>All</b> medication changes are explicitly* stated ( <i>including duration/end date if time-limited</i> )	0 or 2
	- 0 points: No	
	- 2 points: Yes	
3	Reasons for all medication changes are stated	0-2
	- 2 points: The reason for all changes is included	
	- 1 point: The reason for at least one change is included	
	- 0 points: No reasons are stated	
	Discharge summary (intended for the next healthcare provider)	
4	Information about medication treatment is included in the discharge summary ( <i>sufficient if medications at discharge are listed, or if it is stated that medication changes have been made</i> )	0-1
	<ul> <li>O points: No</li> <li>1 point: Yes</li> </ul>	
5	All medication changes are stated	0-2
	- 2 points: All medication changes are explicitly* stated	
	- 1 point: All changes are stated in a general** way	
	<ul> <li>0 points: At least one change is missing, or incorrectly stated</li> <li>O Automatically scored 0 points if item 4 is scored 0</li> </ul>	
	Referral	
6	A referral is sent to the next healthcare provider	0-1
	<ul> <li>0 points: No referral and medication changes were made</li> <li>1 point: Yes, or no referral needed (no medication changes made)</li> </ul>	
	Total	0-9

\* Explicitly: For initiation and changes, state the medication name, strength, dose, dosage, and dosage form. For discontinuation state the medication name.

\*\* General: For example, "Pain relief treatment initiated".

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# Standard Operating Procedure (SOP) for using the CMDD-M

# General Guidelines for Assessment

## Identifying medication changes

- Medications at admission: Check the historical medication list from the day of admission. (Note: Admission could have been in another department.)
- Medications at discharge: Check the historical medication list from the day of discharge.
- Not considered a change:
  - Medications added or removed from the medication list during a medication reconciliation at admission (these are corrections, not changes) as noted in the doctor's or pharmacist's note.
  - Over-the-counter creams that can be purchased without prescription, regardless of the change made.
- Examples of how to assess combination preparations:
  - If Ramipril Comp is discontinued and Ramipril is initiated, this counts as 1 discontinuation and 1 initiation.
  - If two separate medications are switched to a combination preparation this counts as 2 discontinuations and 1 initiation.

# Item-Specific Guidelines for Assessment

## Items 2 and 5

- For initiation or changes to a medication, then name, strength, dose, dosage, and dosage form must be explicitly stated.
- For discontinuation, only the name must be stated.
- Medications prescribed solely for use during the hospital stay do not need to be included, such as intravenous antibiotics, insulin, infusion fluids, and similar medications.

## Item 3

- The reason for a medication change may be acceptable if stated in general terms such as "for the heart", depending on the recipient.

# Item 5

- Examples of general ways to state medication changes include:
  - "Blood pressure medication reduced"
  - "Pain relief treatment initiated"
- Simply stating "new medications prescribed" is not sufficient.

(Unofficial English	version, tra	nsiated from	Swearsh)		
Items	l strongly disagree	I disagree	l agree	l strongly agree	D ki
While in hospital					
1. I felt involved in decisions about my medication treatment that would continue after discharge (e.g., which changes would be made).					
2. I was offered the opportunity to have an informal caregiver present during the discharge consultation.					
3. I felt involved in decisions about the follow-up of my medication treatment.					
After returning home			<u> </u>		
4. I (and/or my informal caregiver) know what changes were made to my medication treatment in the hospital (e.g., new medications, medications I should no longer use, or changes in dosage).	2	icn			
5. I (and/or my informal caregiver) know why my medication treatment was changed in the hospital (e.g., due to newly discovered atrial fibrillation or high blood pressure).		C	TV-		
6. I feel confident that I (and/or informal caregiver) can manage my medication treatment.					
7. I (and/or informal caregiver) know where to turn if I have questions about my medication treatment.					
8. I (and/or my relative) know how my medication treatment will be followed					

# **BMJ Open**

#### Improved medication communication and patient involvement at care transitions (IMPACT-care): study protocol for a pre-post intervention trial in older hospitalised patients

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Keywords:	Clinical Protocols, Health Services for the Aged, Hospital to Home Transition, Medication Adherence, Patient-Centered Care, Pharmacists

## SCHOLARONE<sup>™</sup> Manuscripts

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7 8 9	2	Improved medication communication and patient involvement at care
) 10 11 12	3	transitions (IMPACT-care): study protocol for a pre-post intervention trial in
13 14 15	4	older hospitalised patients
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2 3 4 5	23	ABSTRACT
6 7	24	Introduction
9 10	25	Care transitions, particularly hospital discharge, present significant risks to patient safety. Deficient
11 12	26	medication-related discharge communication is a major contributor, posing substantial risk of harm
13 14 15	27	to older patients. This protocol outlines the Improved Medication Communication and Patient
16 17	28	Involvement at Care Transitions (IMPACT-care) intervention study, designed to evaluate the effects
18 19	29	of a multi-faceted intervention for older hospitalised patients on medication-related discharge
20 21 22	30	communication compared to usual hospital care.
22 23 24	31	Methods and analysis
25 26	32	A pre-post intervention study will be conducted in two surgical and one geriatric ward of a university
27 28	33	hospital in Sweden. The study will begin with a control period delivering usual care, followed by a
29 30	34	training period and then an intervention period. The intervention comprises four components
31 32 33	35	performed by clinical pharmacists: (1) an information package provided to patients and/or their
33 34 35	36	informal caregivers, (2) preparation of medication-related discharge documentation, (3) facilitation
36 37	37	of discharge communication, and (4) a follow-up call to patients or their informal caregiver. Eligible
38 39	38	participants are aged $\geq$ 65 years, manage their own medications independently or with informal
40 41 42	39	caregiver support, and are admitted to the study wards. Each study period (control and intervention)
42 43 44	40	will last until 115 patients have been included. The primary outcome is the quality of medication-
45 46	41	related discharge documentation, assessed using the Complete Medication Documentation at
47 48	42	Discharge Measure (CMDD-M). Secondary outcomes include patients' perceptions of knowledge and
49 50	43	involvement in discharge medication communication, and their sense of security in managing
52 53	44	medication post-discharge; adherence to medication changes from hospitalisation that persist after
54 55	45	discharge; and unplanned healthcare visits following discharge. A process evaluation is planned to
56 57	46	explore how the intervention was implemented. Patient inclusion began in September 2024.
58 59	47	Ethics and dissemination
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2 3 4	48	The study protocol has been approved by the Swedish Ethical Review Authority (registration no.:
5 6	49	2023-03518-01 and 2024-04079-02). Results will be published in open-access international peer-
7 8 0	50	reviewed journals, and presented at national and international conferences.
9 10 11	51	Trial registration number
12 13 14	52	NCT06610214
15 16	53	STRENGTHS AND LIMITATIONS OF THIS STUDY
17 10		
19 20	54	Uses a comprehensive, multi-faceted intervention designed to address gaps in medication
21 22	55	communication both during hospitalisation and after discharge.
23 24	56	• Conducted in both non-surgical and surgical wards, increasing the generalisability of findings
25 26 27	57	to other healthcare settings.
28 29	58	• The inclusion of a process evaluation provides insights into the implementation and
30 31	59	adherence to intervention components, offering valuable information to understand and
32 33 34	60	interpret the study findings.
35 36	61	• The pre-post design without randomisation limits the ability to establish causal relationships
37 38	62	between intervention and observed outcomes.
39 40	63	• Due to the complex, multi-faceted nature of the intervention, it is not possible to determine
41 42 43	64	which specific intervention components contribute most to the observed effects.
44		
45 46 47	65	MAIN TEXT
48 49 50	66	INTRODUCTION
51 52	67	The ageing population is rapidly increasing, with individuals aged 65 and older expected to rise from
53 54	68	10% in 2022 to 16% by 2050 [1]. Older adults frequently experience multiple chronic conditions,
55 56 57	69	making them twice as likely to require hospital care compared to younger adults [2]. Medications are
57 58 59	70	a primary treatment for many health conditions, and as the prevalence of multiple illnesses
60	71	increases, so does the use of medications, increasing the risk of medication-related complications

Page 4 of 54

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[3,4]. One in six hospital admissions and one in five readmissions among older patients are medication-related [5,6], most of which are preventable [7]. Care transitions, particularly hospital discharges, pose significant risks to patient safety and is highlighted by the World Health Organization (WHO) as a focus for healthcare improvements [8]. More than one-third of older patients experience adverse drug reactions within eight weeks post-discharge [9], often attributed to poor communication and coordination between hospitals, subsequent healthcare providers, and patients or their informal caregivers [6,10–13]. Most hospitalised older patients experience changes to their medication regimens, which persist after discharge and should be effectively communicated to all individuals involved in their care [14,15]. Relying on written discharge notes and referrals to bridge communication gaps regarding medication changes and follow-up plans has proven unreliable, as this information is often delivered late or of insufficient quality [16–19]. Discharge consultations often lack structure and patient-centeredness, frequently being treated as a checklist item for healthcare professionals (HCPs) to complete before discharge [20–22]. Physicians tend to adopt an authoritative role in medication discussions, which can discourage older patients from actively participating in their medication management [23]. To foster patient involvement, HCPs should act as advocates rather than paternalistic figures [24]. Patient-centred communication at discharge is essential for equipping patients with the knowledge and confidence to manage their medications and self-care [20]. Involving patients in medical decisions is a key component of patient-centred care, leading to improved patient satisfaction and clinical outcomes, such as better glycaemic and blood pressure control [25,26]. However, older patients may be less inclined or unable to participate actively, often due to factors such as cognitive or physical impairments [27]. Many feel insufficiently empowered to engage in discussions about their medications and tend to rely on HCPs, following prescriptions without question [22,28]. Even when discharge information is presented in a structured format, older patients frequently struggle to retain details about their medications [29]. Informal caregivers

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97 can be vital in supporting patient involvement and bridging communication gaps between HCPs and
98 older patients [12,23].
99 To address these issues, the research project Improved Medication Communication and
Patient Involvement at Care Transitions (IMPACT-care) was initiated [30]. The project began with

101 exploratory studies of the discharge communication [12,19,22], ultimately leading to the

102 development of the intervention presented in this protocol.

103 Aims and objectives

104 The overall aim is to evaluate the effects of a multi-faceted intervention on improving medication-105 related discharge communication for older hospitalised patients, compared to usual hospital care.

106 The primary objective is to assess the intervention's impact on the quality of written

107 medication-related discharge documentation compared to usual hospital care. Secondary objectives

108 include evaluating the intervention's effect on patients' perceived involvement in discharge

109 medication communication and their confidence in post-discharge medication management, as well

110 as adherence to medication changes from hospitalisation that persist after discharge, and the need

111 for unplanned healthcare visits following discharge, all in comparison to usual hospital care.

#### 3 112 METHODS AND ANALYSIS

113 This protocol was developed and reported in accordance with the Standard protocol items:

114 recommendations for interventional trials (SPIRIT) 2013 statement [31], the SPIRIT-outcomes 2022

115 extension [32], and the Template for intervention description and replication (TIDieR) checklist [33].

#### 7 116 Study design

117 This prospective intervention study uses a pre-post design (Figure 1). Control patients will be
118 enrolled first (control period), followed by a training phase during which HCPs in the study wards will
119 be trained to implement the intervention. Once the HCPs have undergone training sessions, the
120 intervention period will start. Enrolment during both the control and intervention period will stop
121 once the target sample size is reached, with patient follow-up continuing for four months post-

Page 6 of 54

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discharge. Based on the pilot study, the control and intervention periods are each expected to last
approximately six months, and the training phase will last around two months. Figure 1 provides a
schematic overview of the study design. Study enrolment began in September 2024, and
recruitment of participants for the intervention group is currently ongoing as of April 2025. *Rationale for study design*

A randomised trial was deemed infeasible - neither at the patient level, due to contamination risks, nor at the ward level or as a stepped-wedge design, as these would require a large number of wards and exceed available resources. Consequently, a pre-post study design was selected, complemented by an interrupted time series (ITS) analysis for exploratory purposes. The ITS analysis, analysing data at regular intervals both before and after the intervention, allows for a more nuanced interpretation of the primary results by accounting for potential seasonal variations and changes in effect over time.

1 134 Settings

135 The study is conducted in two surgical wards and one geriatric ward at Uppsala University Hospital in

 $\frac{1}{6}$  136 Sweden. The surgical wards mainly handle emergency surgeries, as well as liver-pancreas,

transplantation, oesophagus-stomach, endocrine, and colorectal surgeries. The geriatric ward treats

0 138 older patients with complex acute medical and rehabilitation needs. These two clinical specialties

139 were selected to assess whether the intervention could have an effect across various clinical

5 140 settings.

<sup>7</sup><sub>8</sub> 141 Study population and recruitment

Patients aged 65 years or older, who manage their own medications either independently or with
support from an informal caregiver, and are admitted to the study wards, are eligible for inclusion.
An informal caregiver is defined as an unpaid individual, often a family member, who assists the
patient with daily activities, healthcare communication, and medication management. Exclusion
criteria apply if patients meet any of the pre-determined conditions that would hinder the successful

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delivery of the intervention or the reliable collection of outcome data (a detailed list is provided in
Table 1).
The researchers, who are employed by the hospital, screen the admission lists of the study
wards daily on weekdays to identify eligible patients, who are then asked for inclusion by the
researchers or clinical pharmacists on the ward. Eligibility is primarily determined through the
patient's electronic health records (EHR), with any uncertainties resolved through discussions with
HCPs at the study wards. Once identified, patients are informed both verbally and in writing, and

9 154 written informed consent (Supplementary material I) is requested. Patients meeting exclusion

1 155 criteria 10-15 in Table 1 are excluded at discharge.

156 During the recruitment of control patients, all patients fulfilling the inclusion and exclusion

criteria are invited to participate. During the intervention period, patient inclusion is determined

based on the capacity of the pharmacists performing the intervention. The pharmacists' capacity will

be evaluated through regular feedback discussions, ensuring that the inclusion process aligns with

160 their workload. If the number of eligible patients exceeds the pharmacists' capacity, the pharmacist,

161 in collaboration with the research team, will determine how many eligible patients can be included.

To prioritise which patients to include, a random priority number will be generated for each eligible

patient at the study ward level using Microsoft Excel, with those assigned the highest priority

164 included first.

**Table 1.** The inclusion and exclusion criteria in the study. Patients meeting exclusion criteria 1-9 are excluded at the time of hospital admission, while those meeting exclusion criteria 10-15 are excluded at the time of discharge.

#### Inclusion criteria

1. 65 years or older.

2. Manages their own medications, either independently or with support from an informal caregiver, prior to inclusion.

#### **Exclusion criteria**

#### Checked at hospital admission

1. Registered in a region outside the study hospital (limited data availability).

2. Admitted from a nursing home (no own medication management prior to admission).

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4		3. Unable to receive information or provide consent independently (due to cognitive
5		A Algorithm of unresponsiveness).
0 7		4. Already included in the study.
, 8		5. Patient delocalised to the study ward with another medical discipline responsible for the
9		patient's care (formally, no study ward patient).
10		6. In a late palliative phase prior to inclusion (intervention not suitable).
11		7. Unable to communicate in Swedish (hindering intervention delivery).
12		8. Has restricted personal information in the EHR (limited data availability).
13		9. Admitted for transplantation (intervention not suitable).
14		Checked at hospital discharge
15 16		
17		10. Discharged to a nursing home (intervention not suitable).
18		11. Patient transitions to late palliative phase during the hospitalisation (intervention not
19		suitable).
20		12. Patient is transferred to a non-study ward and is discharged from there (hindering
21 22		intervention delivery).
22 23		13. The patient dies during the course of the hospital stay (hindering intervention delivery).
23		14. No medication changes that last post-discharge during the hospitalisation (intervention
25		not suitable).
26		15. The duration of stay on the study ward is less than 48 working hours (excluding time from
27		4:00 PM before weekends/public holiday to 8:00 AM the day after a weekend/public
28		holiday) (hindering intervention delivery).
29	168	EHR = electronic health records
30 21		
32		
33	169	Intervention development
34	470	
35	170	The intervention aims to improve medication communication during the discharge process for older
36 27	474	
37 38	1/1	patients. It was designed by a multidisciplinary team comprising researchers with backgrounds in social
39	170	
40	1/2	science, pharmacy, medicine, and nursing. Several team members also work professionally as healthcare
41	170	prostitionary in clinical actings, contributing practical insights from anguing patient care. In addition, the
42	1/5	practitioners in clinical settings, contributing practical insights from ongoing patient care. In addition, the
43	17/	team included two nublic representatives ensuring that the perspectives of natients and informal
44	1/4	team included two public representatives, ensuring that the perspectives of patients and information
45	175	caregivers were meaningfully integrated. The design built on findings from previous research conducted
46 47	1/5	caregivers were meaningrung integrated. The design built on minings from previous research conducted
47 48	176	by our group [12, 19, 22]. The inclusion rate, as well as the feasibility of selected intervention
49	1,0	of our group [12,13,22]. The metasion rate, as wen as the reasionity of selected intervention
50	177	components and outcome measures, were tested in unpublished pilot studies conducted at geriatric
51	±//	components and outcome measures, were tested in anpublished pilot studies conducted at genathe
52	179	and surgical wards at Uppsala University Hospital Sweden. These studies involved a total of 106
53	110	and surficer wards at oppsala oniversity nospital, sweden. These studies involved a total of 100
54	170	natients between Sentember 2023 and May 2024 (Nordin L. Berlin K. Sabouni V. du Thinh C. at al.
55	113	patients between September 2025 and May 2024 (Norum J, Berlin K, Sabourii T, du Thinn C, Et Ul.
56	190	Eacilitating nations amnowerment at beenital discharges A pilot study testing the feacibility of the
57 58	100	i acintating patient empowerment at nospital discharge. A pilot study testing the leasibility of the
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Page 9 of 54

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IMPACT-care intervention, unpublished). Based on the results of these pilot studies, the intervention and study design were refined before advancing to the main trial.

#### **Control period (preintervention)**

During the control period, care as usual will be provided at the study wards. Clinical pharmacists are part of the care team at the wards and primarily assist with medication reviews at patient admission and discharge but are not routinely involved in the discharge communication process. At hospital admission, medication reconciliation is conducted by either a pharmacist or a physician. If needed, a medication review is carried out by the physician, with or without support from a pharmacist. Any changes to the patients' medication lists are made by wards physicians or nurse practitioners (specialised nurses at the surgical wards). Oral medication-related communication with the patient and/or informal caregiver, is typically handled by nurses, physicians, and pharmacists during patient consultations. At discharge, hospitals are required to provide a discharge summary to the next healthcare provider(s) and a discharge letter intended for the patient [34,35]. Both documents are typically prepared by ward physicians and include details about the hospitalisation, medication changes (along with the rationales for those), planned treatment duration, and follow-up plans. The discharge letter, however, is expected to be written in layman's language. In some cases, these discharge documents are written by a physician who has not met the patient prior to discharge. Pharmacists sporadically assist in preparing these discharge documents, but not in a standardised manner. Additionally, it is standard practice for ward physicians to send specific referrals to the next healthcare provider(s), outlining follow-up requests related to medication changes. In addition, ward physicians conduct an oral discharge consultation, during which the patient is informed about the medication changes and follow-up plans before discharge.

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While patients receive written information materials with practical information about the wards and surgical procedures at admission, no materials specifically address medications or medication communication at discharge. Inviting informal caregivers to participate in discharge

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206 consultations and HCPs conducting follow-up calls after discharge occurs in selected cases but is not207 routine practice.

208 Implementation period: training of HCPs

The training period will last approximately two months between the control and intervention phases. During this period, HCPs - primarily physicians and pharmacists on the study wards - will undergo training. Training of physicians will focus mainly on the importance of writing discharge documentation and effectively utilising pharmacist support for this process. Training of pharmacists, on the other hand, will focus on implementing the intervention components and understanding the principles of person-centred medication communication at discharge. The training will be delivered through multiple sessions led by the researchers, addressing how the study may impact daily ward processes and how to integrate the intervention components into existing practices. To accommodate newly hired HCPs during the intervention period, as well as those unable to attend the live sessions, digital training materials will be developed and distributed to ensure that all necessary training can be completed. Additionally, the pharmacists, who play a central role in delivering the intervention components, will receive a standardised operation procedure document. Other HCPs on the wards, excluding physicians and pharmacists, will be informed about the study through meetings and information emails, which will outline how they may be affected by the study. For training purposes, selected patients will undergo the intervention components without being included in the study. Additionally, one of the researchers will also regularly visit the study wards to support the HCPs in implementing the intervention components during this phase.

<sup>9</sup> 226 Intervention period

227 The intervention is designed to be implemented on hospital wards by clinical pharmacists who are
 228 already part of the patient care team. Each of the study wards in our study has a full-time equivalent
 229 clinical pharmacist present during weekday office hours, with a continuous presence established
 230 over the past 15 years before the study began. The pharmacists involved have varying levels of

Page 11 of 54

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4	231	experience, from limited to more extensive, some of whom have a one-year full-time postgraduate
5 6 7	232	MSc in clinical pharmacy. All relevant details about the completed intervention components and any
/ 8 0	233	other actions taken by the pharmacist will be documented as usual in the patient's EHR. The
9 10 11	234	IMPACT-care intervention consists of the following four components (Figure 2):
12 13	235	1. Information package provided to patients and/or informal caregivers.
14 15	236	In our pre-study [22], it was identified that medication-related discharge communication is not
16 17	237	tailored to support patients' self-care needs post-discharge. Additionally, patients were unprepared
18 19 20	238	for medication-related consultations prior to discharge. To address these challenges, the research
21 22	239	team, inspired by a similar intervention component developed in the UK [36], designed an
23 24	240	information package consisting of a patient booklet (Supplementary material II) with input from
25 26 27	241	clinical pharmacists at Uppsala university hospital and a panel of public representatives.
27 28 29	242	The booklet is designed to inform, prepare, and engage patients and/or their informal
30 31	243	caregiver in medication communication at discharge and self-care after returning home. It is
32 33	244	organised into four sections: 1. Hospitalisation course, 2. Medications, 3. Discharge, and 4. Advice on
34 35 26	245	self-care. The first two sections feature a question prompt list [37], a set of discussion points
30 37 38	246	intended to guide conversations with HCPs and encourage patients to actively participate in their
39 40	247	care. The use of questions prompt list has been found to enhance patient participation in
41 42	248	medication-related communication [38,39]. The third section contains a checklist of essential points
43 44	249	for patients to review with HCPs to help confirm they have sufficient knowledge before leaving the
45 46 47	250	hospital. The final section provides practical advice on seeking medication and general healthcare
48 49	251	support after returning home.
50 51	252	Patients will receive the booklet in printed format at admission to the study ward and will be
52 53	253	accompanied by an oral consultation with one of the researchers who also practices clinically as a
54 55 56	254	pharmacist. During the consultation, the pharmacist will explain the content and guide the patient
57 58	255	on how to use the booklet effectively. The booklet will also be available online. If the patient wishes,
59 60	256	the pharmacist will provide the patient's informal caregiver access to the information package. This

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can be done in person if the caregiver is present at the ward or remotely via phone, guiding them onhow to access the materials online.

259 2. Preparation of medication-related discharge documentation.

Incompleteness and poor quality of medication-related discharge communication from hospitals is a common problem [40,41], making it difficult for subsequent HCPs to trust this information [12,17,42]. Pharmacist involvement can significantly improve the completeness and quality of such communication [40,41]. Consequently, in our study, the pharmacist will review relevant parts of the patient's EHR and medication list prior to discharge to identify any lasting medication changes made during the hospitalisation. The pharmacist will collaborate with the discharging physician to reconcile follow-up plans for these changes. All medication changes, including reasons for the adjustments (when known), planned treatment duration, follow-up plans, and the ward's phone number for any post-discharge inquiries from the patient, will be documented in a standardised manner in the EHR by the pharmacist. This documentation will form the basis for detailing medication changes and follow-up plans in the patient's discharge letter and the discharge summary intended for the next healthcare provider, both of which are written by a ward physician.

272 3. Facilitation of discharge communication.

To increase the likelihood that patients and their informal caregiver remember and use the booklet provided to them during intervention component 1, the pharmacist will consult the patient as the discharge date approaches. The consultation will include a review of the booklet's content and a reminder to use it. If the patient wishes, the pharmacist will also contact the patient's informal caregiver, either by phone or face-to-face, depending on the situation, to review the booklet and remind them to use it.

Informal caregivers are considered as valuable support in helping patients recall information
 and manage self-care after returning home [12]. However, they are often involved in a limited way in
 medication-related discharge communication by HCPs [22,43]. To address this gap, the pharmacist in
 our study will arrange for an informal caregiver to attend the discharge consultation with the

Page 13 of 54

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physician, if the patient so wishes. The pharmacist will contact the informal caregiver by phone once the discharge date is confirmed - no later than the morning of discharge - and invite them to participate in the consultation. Participation can be in person, by phone, or via video call depend on their availability. The pharmacist will then inform the discharging physician that the patient has requested their informal caregiver's involvement in the discharge consultation. 4. Follow-up call to patients or their informal caregiver. The timing of medication-related discharge communication often occurs at a suboptimal momen patients, making it difficult for them to retain and recall the information after returning home [2: Incorporating intervention components both during hospitalisation and after discharge can help support medication continuity in older patients and bridge transitions [44]. Telephone follow-up particular, have shown promise in enhancing this support [44]. Therefore, in our study, patients their informal caregiver (based on the patient's preference) will be offered a follow-up call with clinical pharmacist post-discharge. If requested, the appointment for this call will be scheduled in consultation with the patient/informal caregiver, between 3-7 days after discharge, depending o the patient's availability. The pharmacist will then contact the patient/informal caregiver at the agreed time. During the call, the pharmacist will start by addressing any questions the patient/informal caregiver may have, providing direct answers or referring inquiries to the appropriate HCP as needed. Following this, the pharmacist will review the medication-related discharge information, focusing on the updated medication list and details outlined in the discha letter, including medication changes, reasons for the adjustments, planned treatment duration, follow-up plans. Additionally, the pharmacist will remind the patient of the advice on when and to seek care, as presented in the booklet provided during intervention component 1. Outcomes All outcomes will be assessed for participants from both the control and the intervention group (Table 2). 

60 308 Primary outcome

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3 4	309	The improvement in the quality of medication-related discharge documentation will be the primary
5 6	310	outcome, assessed using the average score from the Complete Medication Documentation at
7 8	311	Discharge Measure (CMDD-M) (Supplementary material III) [45]. This point-based instrument,
9 10 11	312	ranging from 0 to 9 points, is based on Swedish legislation [35] outlining the requirements for
12 13	313	written medication-related discharge documentation. The CMDD-M comprises five items, each
14 15	314	scored from 0-1 or 0-2 points depending on the criteria. It evaluates the completeness and quality of
16 17 18	315	medication-related discharge documents for individual hospital discharges, including the patient's
19 20	316	discharge letter, the discharge summary intended for the next healthcare provider, and the presence
21 22	317	of a follow-up request to bridge the gaps post-discharge. Improving the quality of discharge
23 24	318	documentation is critical for ensuring continuity of care and patient safety during transitions of care
25 26 27	319	[17]. Poor-quality documentation has been associated with medication errors [11], non-adherence
28 29	320	[46], and avoidable need for medical care after discharge [47,48]. By focusing the primary outcome
30 31	321	on this domain, the trial aims to address an important gap in care that impacts patient outcomes.
32 33	322	Secondary outcomes
34 35 36	323	• The proportion of patients with complete medication-related discharge documentation. This
37 38	324	will be assessed using the CMDD-M to determine the prevalence of patients achieving the
39 40	325	maximum score of 9 points.
41 42	326	Improvement in patients' perceptions of knowledge and involvement in discharge medication
43 44 45	327	communication, and their sense of security in post-discharge medication management. This will
46 47	328	be assessed by the average score by the Patient Involvement in Medication Communication at
48 49	329	Hospital discharge Questionnaire (PIMCH-Q) (Supplementary material IV). It consists of eight
50 51	330	statements rated on a four-point Likert scale. It is designed with three dimensions: perception
52 53	331	of knowledge, involvement, and sense of security, and aims to measure patients' perceived
54 55 56	332	involvement in medication communication during hospitalisation and their sense of security in
57 58	333	managing medications after discharge. The questionnaire will be sent to patients one week
59 60	334	post-discharge.

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3 4	335	• Adherence to medication changes made during hospitalisation that persist post-discharge. This
5 6	336	will be assessed by measuring the number of instances of non-adherence. Non-adherence to a
7 8	337	medication change is defined as follows:
9 10 11	338	a. New or modified medications: A medication initiated or modified during
12 13	339	hospitalisation (i.e., changes in strength, dose, or formulation) that is not dispensed
14 15	340	from a community pharmacy within 14 days post-discharge This applies regardless
16 17	341	of whether the reason is a missing prescription or the patient not filling the
18 19	342	prescription. Changes in strength or dose are included only when they create a
20 21 22	343	safety risk for the patient if the previous prescription is used (e.g., reducing the dose
22 23 24	344	of a tablet from 10 mg once daily to 2.5 mg once daily, which would require the
25 26	345	patient to split the same tablet twice to get the correct dose, a practice considered
27 28	346	unsafe).
29 30	347	b. Discontinued medications: A medication discontinued during hospitalisation (or with
32 33	348	altered strength or formulation) that is erroneously dispensed using a previous
34 35	349	prescription within 120 days post-discharge.
36 37	350	The rationale for collecting data up to 120 days post-discharge is based on standard
38 39	351	pharmacy practices in Sweden, where medications are typically dispensed for a 90-
40 41 42	352	day (three-month) supply at a time. Patients may have leftover supplies of
43 44	353	discontinued medications at home and continue using them. However, if these
45 46	354	medications are not refilled at a pharmacy within 120 days, the patient is considered
47 48	355	adherent to the discontinuation.
49 50 51	356	• The proportion of patients who are fully adherent to the medication changes made during
52 53	357	hospitalisation that persist post-discharge. This will be assessed by determining the
54 55	358	prevalence of patients who have no instances of non-adherence as described above.
56 57	359	• Unplanned healthcare visits post-discharge. This will be assessed using the following outcome
50 59 60	360	measures:

3 4	361	0	The prevalence of patients with at least one unplanned hospital revisit (a composite
5 6	362		measure of unplanned readmissions and emergency department visits) at 7, 30, and
7 8	363		90 days post-discharge.
9 10 11	364	0	The prevalence of patients with at least one unplanned readmission at 7, 30, and 90
12 13	365		days post-discharge.
14 15	366	0	The prevalence of patients with at least one emergency department visit (not
16 17	367		followed by admission) at 7, 30, and 90 days post-discharge.
18 19	368	0	The time to the first unplanned hospital revisit within 90 days.
20 21 22	369	0	The time to the first unplanned readmission within 90 days.
23 24	370	0	The time to the first emergency department visit within 90 days.
25 26	371	0	The prevalence of patients with at least one potentially medication-related hospital
27 28	372		readmission at 7, 30, and 90 days post-discharge, assessed using the validated AT-
29 30	373		HARM10 tool [49,50].
31 32	374	Table 2. Timeli	ne and overview of the scheduled data collection for both the control and

# **Table 2.** Timeline and overview of the scheduled data collection for both the control and intervention group participants.

	Admission	Discharge	Follow-up				
Time points (day)	<b>-1</b> <sup>α</sup>	0	7	14	30	90	120
Study inclusion			0				
Eligibility screening	x	x					
Informed consent	x						
Demographic data	x	x					
Outcome measures							
CMDD-M <sup>β</sup>		x					

2 3 4	
5 6	
/ 8 0	
) 10 11	
12 13	
14 15	
16 17	
18 19	
20 21 22	270
22 23 24	376
25 26	378 379
27 28	380
29 30	382
31 32	282
33 34 35	202
36 37	204
38 39	303
40 41	386
42 43	387
44 45	388
46 47 49	389
48 49 50	390
50 51 52	391
53 54	392
55 56	393
57 58	394
59 60	

ΡΙΜϹΗ-Q <sup>γ</sup>		x				
Adherence to medication changes			х			х
Hospital revisits		x		х	x	
Hospital readmissions		x		x	x	
Emergency department visits		x		х	x	
Medication-related readmissions		x		x	x	

 $2^{\circ}$  376 <sup> $\alpha$ </sup> Time point at which the patient is admitted to the study ward.

 $^{\beta}$  CMDD-M, a point-based instrument using data from the patient's electronic health records.

378 <sup>γ</sup> PIMCH-Q, a questionnaire to patients measuring their perceptions of involvement in discharge medication
 379 communication and their confidence in post-discharge medication management.

380 CMDD-M = complete medication documentation at discharge measure, PIMCH-Q = patient involvement in medication communication at hospital discharge questionnaire

#### 382 Data collection

Screening of patients at the study wards will be performed by the researchers, who are employed by 3 1 the hospital. This will be done using information from the EHR and, if any unclarities occur, through 5 contact with the ward HCPs. The researchers will invite eligible patients to participate and patients 6 willing to participate will be asked to sign informed consent (Supplementary material I). Data will be 7 collected from all participants, regardless of their adherence to the intervention, provided they do 8 not withdraw their consent to participate in the study. This approach ensures complete follow-up 9 data for inclusion in the intention-to-treat (ITT) analysis. The data collection will proceed in several C steps (Table 2) and will be conducted by researchers in the research team and trained research assistants. To ensure uniformity of data collection, standard operating procedures have been developed. Data will be pseudonymised and transferred to case report forms (CRFs) in an electronic 2 3 data capture system, REDCap [51]. All data processing and analysis will be based on the data in these 1 CRFs and will be shared and discussed in pseudonymised form. Any forms and electronic files that

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> reveal research data of an individual patient will be stored in a locked archive at the hospital pharmacy. Access to the final trial dataset will be restricted to the members of the research team. Demographic data Demographic data collected from the EHR will include age, gender, renal function, admission and discharge dates, medication treatment at admission and discharge, whether the patient has support by automatic dose-dispensation of medications, disease diagnoses, primary diagnosis for admission, home care support, whether the patient lives alone, and the number of emergency department visits and hospital admissions in the past year. Information about patients' education level will be gathered through the researchers asking the patients at inclusion. Completeness and quality of discharge documentation After patient discharge, the discharge letter, discharge summary, and referrals to next healthcare providers for follow up will be extracted from the EHR for scoring according to CMDD-M (Supplementary material III). The instrument was specifically developed to be used in clinical settings in Sweden. Initial validation demonstrated that the instrument is feasible for use in our setting [45]. Inter-rater reliability was assessed using Cohen's weighted kappa with both linear (Kw linear) and quadratic (Kw quadratic) weights. The Kw linear for the comparison between two clinical pharmacists was 0.92, while the comparison between their consensus and a geriatrician yielded a Kw linear of 0.64. Similarly, the Kw quadratic was 0.97 for the comparison between the pharmacists and 0.80 for the comparison between their consensus and the geriatrician. These findings indicate moderate to almost perfect reliability between raters and suggest that the CMDD-M instrument provides robust reliability in assessing the quality and completeness of medication-related discharge documentation in older hospitalised patients [45]. The CMDD-M was selected as the primary outcome, as it was deemed the most appropriate and feasible option. Although only component 2 (preparation of medication-related discharge documentation) of the intervention is expected to have a direct effect on this measure, components 1 (information package provided to patients) and 3 (facilitation of discharge communication) are also expected to exert indirect effects on the CMDD-M score by encouraging

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421 patients/informal caregivers to request the discharge documents to which they are entitled and to ask 422 more questions about their medications. This, in turn, is anticipated to prompt physicians to provide 423 more explicit information in the documentation. Several alternative outcomes were considered but found 424 to be less suitable, e.g. unplanned hospital revisits would require an unfeasibly large sample size; the 425 PIMCH-Q lacks complete validation; and measuring adherence to medication changes raised concerns 426 about precision. These outcomes were therefore designated as secondary. Given its design and focus on 427 aspects directly relevant to our intervention, we anticipate it to effectively capture meaningful 428 changes within our study sample, even though the responsiveness of the CMDD-M to changes in the 429 completeness and quality of discharge documentation in response to an intervention has not yet 430 been evaluated. To ensure objectivity, the assessment using the CMDD-M will be conducted by the 431 researchers in a blinded manner. Data extracted from the EHR will be masked to prevent assessors 432 from linking patients to specific time periods, ensuring they remain unaware whether the patient 433 belongs to the control or intervention group.

2 434 Patients' experience

435 The PIMCH-Q will be sent to patients by mail or email, depending on their preferences, one week 436 after the discharge date (Supplementary material IV). The patients are asked to answer the 437 questionnaire as soon as possible. If no response is received within 10 days, the research team will 438 follow-up with a reminder via email or phone. During the reminder call, patients will also be offered 439 the option to respond by phone if preferred. The PIMCH-Q was selected for this study because, to 440 the best of our knowledge, no existing instrument adequately captures medication-related patient 441 experiences during hospital discharge. While its responsiveness has not yet been validated, the tool 442 was specifically designed to assess patient involvement in medication communication and 443 confidence in medication management post-discharge, which are core aspects of this study. Despite 444 the need for further validation, the PIMCH-Q remains the most suitable tool for achieving our study 445 objectives.

9 446 Adherence to medication changes

Data about the lasting medication changes made and prescribed during hospitalisation will be gathered from the EHR. Information on medications dispensed from pharmacies for each patient 120 days post-discharge will be obtained from the Swedish National Board of Health and Welfare's national prescribed drug register. This register contains data on all medications dispensed from community pharmacies in Sweden on a patient level. The extracted data will include the medication name, the anatomical therapeutic chemical code, strength, prescribed quantity, collected quantity, prescription date, collection date, prescriber's profession, and workplace. The assessment of the number of instances of non-adherence will be conducted by the researchers.

455 Healthcare Utilisation

Unplanned hospital revisits, readmissions, emergency department visits, and time to these hospital revisits within 90 days will be extracted from the EHR. The assessment whether the hospital readmissions were potentially medication-related will be conducted retrospectively and blinded, using the AT-HARM10 tool [49] through information from the EHR. The assessment will be conducted by one clinical pharmacist and one physician who are not otherwise involved in the study. Initially, they will independently evaluate each case, followed by a discussion to reach consensus on cases where their initial assessment (e.g., whether a readmission is potentially medication-related) differed.

**Process evaluation** 

4 465 A mixed-method approach, combining both quantitative and qualitative methods, will be used for a
 466 process evaluation to assess adherence to the study protocol and explore the implementation of the
 467 intervention. The evaluation will be guided by the framework for process evaluation developed by
 468 the UK Medical Research Council [52].

3 469 Quantitative Process Evaluation

5 470 The quantitative process evaluation will include all patients in the study to gain insight into the

471 extent of intervention implementation, the degree to which some intervention components may

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2 3	472	already be in place during the control period, and adherence to the study protocol. The following
4 5 6	473	data will be collected from the EHR:
7 8	474	• The proportion of control and intervention patients who received a discharge letter.
9 10 11	475	• The proportion of control and intervention patients for whom the clinical pharmacist
12 13	476	prepared a medication discharge documentation.
14 15	477	• The proportion of intervention patients who received the information package.
16 17 18	478	• The proportion of control and intervention patients for whom the physician used the
19 20	479	medication discharge documentation prepared by the pharmacist. This is measured by
21 22	480	manually comparing the content of the prepared medication discharge documentation by
23 24	481	the pharmacist with the actual medication summary in the discharge letter and final note
25 26 27	482	written by the physician.
27 28 29	483	• The proportion of intervention patients who are reminded by the pharmacist to review the
30 31	484	information package.
32 33	485	• The proportion of intervention patients who wish to have an informal caregiver present at
34 35 26	486	the discharge consultation, and the proportion of those cases where the pharmacists
37 38	487	contacts the informal caregiver to be present.
39 40	488	• The proportion of intervention patients who wish to have a follow-up call with a pharmacist
41 42	489	after discharge, received the follow-up call, and whether it led to any pharmacist
43 44 45	490	intervention, including details of the intervention.
46 47	491	Additional data collection methods:
48 49	492	• The proportion of all employed physicians and clinical pharmacists at the study wards who
50 51	493	attend the training sessions. All HCPs attending the training sessions will be registered by the
52 53 54	494	researchers. Data on HCPs who complete digital training sessions will be extracted from the
54 55 56	495	digital training platform.
57 58	496	• The response rate of PIMCH-Q, along with the distribution method (paper, telephone, or
59 60	497	digital). This will be extracted from REDCap.

Page 22 of 54

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3 4	498	• The proportion of control and intervention patients who recall having a discharge
5 6	499	consultation, whether they wished to have an informal caregiver present, whether an
7 8	500	informal caregiver was actually present, their desire for a follow-up call, and whether they
9 10 11	501	received one. For control patients, these questions aim to determine the extent to which
12 13 14 15 16 17	502	intervention components are performed as part of standard care. Additionally, for
	503	intervention patients, the proportion of patients who recall receiving the information
	504	package (intervention component 1) and their perception of it will be asked. These questions
18 19 20	505	will be sent to patients alongside the PIMCH-Q.
20 21 22	506	• The amount of time used by pharmacists to deliver each component of the intervention, as
23 24	507	well as the overall intervention, will be measured in a subset of the sample.
25		
26 27	508	Qualitative Process Evaluation
28 29 30 31 32 33 34	509	Regular meetings with the pharmacists delivering the intervention will be scheduled during the
	510	intervention period to discuss and address implementation barriers that could be resolved to
	511	support successful implementation.
35 36	512	At the conclusion of the intervention phase, a qualitative process evaluation will be
37 38 30	513	conducted with HCPs and patients. This will involve semi-structured interviews and focus groups
39 40 41	514	with HCPs, specifically physicians and pharmacists from the study wards, who were actively involved
42 43	515	in delivering the intervention, to explore their experiences and perceptions of its implementation.
44 45	516	Semi-structured interviews will also be conducted with patients, and when applicable their informal
46 47	517	caregiver, who received components of the intervention. This qualitative component will offer
48 49 50	518	insights into how patients perceived the intervention. Patient interviews will be conducted either
51 52	519	shortly before or within one week after discharge. A purposeful sampling approach will be adopted
53 54	520	to obtain maximum variation. For HCP focus groups and interviews, variation will be sought in terms
55 56	521	of sex, working experience, and study ward [53]. The same approach will be applied for patient
57 58 59 60	522	interviews but this time to capture heterogeneity in age, sex, and health complexity. The concept of

Page 23 of 54

1 2 BMJ Open

3 4	523	information power will guide the decision of sample size [54]. All interviews and focus groups will be
5 6 7	524	audio-recorded and transcribed verbatim. The data will be analysed thematically [55].
8 9 10	525	Sample size calculation
11 12	526	The sample size calculation is based on the primary outcome, which is the quality of medication-
13 14	527	related discharge documentation measured using the CMDD-M. The intervention will be deemed
15 16	528	successful if the average score is significantly higher in the intervention group compared to the
17 18 19	529	control group. For the calculation, we assumed an evenly distributed sample between the two
20 21	530	groups and set the target difference in CMDD-M scores at one point. This conservative target was
22 23	531	chosen as it represents the smallest measurable step in the instrument. In practice, a one-point
24 25	532	difference may indicate the inclusion of medication changes in the discharge letter or discharge
26 27 28	533	summary. Such an improvement reflects a critical enhancement in quality, with important
20 29 30	534	implications for patient safety and continuity of care. Data from the pilot studies indicated that the
31 32	535	baseline value for CMDD-M was 3.9 (SD 2.6) (Nordin J, Berlin K, Sabouni Y, du Thinh C, et al.:
33 34	536	Facilitating patient empowerment at hospital discharge: A pilot study testing the feasibility of the
35 36 27	537	IMPACT-care intervention, unpublished). Due to the maximum score limit in CMDD-M, the variance
37 38 39	538	in scores is expected to differ between the control and intervention periods. This difference arises as
40 41	539	scores may cluster near the upper limit, particularly in the intervention period where improved
42 43	540	performance is anticipated, potentially leading to reduced variability compared to the control
44 45	541	period. A two-sided t-test with Welch's correction for degrees of freedom (to account for the
46 47 48	542	variance difference between groups) was used. A power of 0.8 was considered sufficient to detect
49 50	543	an increase, with a 5% two-sided significance level. Based on these assumptions, a sample size of
51 52	544	115 patients per group, for a total of 230 patients, is required.
53 54	545	Additionally, a permutation test using the Mann-Whitney U-test was performed to assess
55 56 57	546	the robustness of the t-test, yielding similar results.
58 59 60	547	Statistical analysis

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2 3	5.40	
5 4 5 6 7 8 9 10 11	548	A full statistical analysis plan (SAP) will be finalised prior to any analyses. Statisticians from the
	549	Uppsala Clinical Research Center (UCR) will oversee the statistical analyses. The primary analysis will
	550	follow the ITT principle, including all included patients in their assigned groups, regardless of
	551	protocol adherence. Additional analyses will include per-protocol (PP) analyses, i.e. excluding
12 13	552	patients with protocol violations.
14 15 16 17 18 19 20	553	Descriptive analyses of the study population will be performed, with continuous data
	554	presented as mean $\pm$ standard deviation (SD) for normally distributed variables or as median and
	555	range for non-normally distributed variables. Categorical variables will be reported as frequencies
20 21 22	556	and percentages. All outcomes will be summarised by study group, overall and by ward,
23 24	557	descriptively. Comparative statistics between study groups will be conducted, with all statistical tests
25 26	558	being two-sided and a p-value less than 0.05 considered statistically significant.
27 28 29	559	Models for analysing primary and secondary outcomes will include both unadjusted and fully
30 31	560	adjusted analyses. Adjustments will account for age, gender, education level, ward type (geriatric or
32 33	561	surgical), number of medication changes persisting post-discharge, number of medications at
34 35	562	discharge, support by automatic dose-dispensation of medications, and duration of hospitalisation.
36 37 28	563	Effect estimates, including odds ratios, hazard ratios, and rate ratios will be presented with 95 % CI
39 40	564	and p-values.
41 42	565	Primary outcome analysis
43 44	566	Linear regression models with robust standard errors will be used to estimate the effect of the
45 46 47	567	treatment groups on the CMDD-M score. The results will be reported as effect estimates. A
47 48 49	568	sensitivity analysis of the primary outcome will be performed using a permutation-based Wilcoxon
50 51	569	non-parametric test.
52 53	570	Secondary outcome analysis
54 55	571	Logistic regression will be used to analyse the prevalence of patients achieving the maximum score
56 57 58	572	(9 points) on the CMDD-M, with results presented as odds ratios. The PIMCH-Q score will be
59 60	573	analysed using linear regression models, evaluating the three dimensions both separately and in
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3 4	574	total. Differences in the number of instances of non-adherence to medication changes persisting
5 6	575	post-discharge will be assessed using quasi-Poisson regression models, with results reported as rate
7 8	576	rations. Logistic regression models will be used to analyse the prevalence of patients who are fully
9 10 11	577	adherent to medication changes persisting post-discharge, with results reported as odds ratio.
12 13	578	The difference in the prevalence of patients with unplanned hospital revisits, unplanned
14 15	579	readmissions, emergency department visits and medication-related readmissions at 7, 30, and 90
16 17	580	days post-discharge will be compared with logistic regression models, with results presented as odds
18 19 20	581	ratios. Time to first unplanned hospital revisit, time to first unplanned readmission, and time to first
20 21 22	582	emergency department visit will be analysed using Cox proportional hazards models. Patients who
23 24	583	do not experience the event by the end of the study period or are lost to follow-up will be censored
25 26	584	at their last known follow-up time, while patients who die before experiencing the event will be
27 28	585	censored at the time of death. Results will be reported as hazard ratios.
29 30 31	586	Exploratory analyses
32 33	587	To analyse data collected at multiple regular intervals before and after the intervention, an ITS-
34 35 26	588	analysis will be performed. A linear regression model will be estimated as follows:
37 38	589	Y=b <sub>0</sub> +b <sub>1</sub> T+b <sub>2</sub> I+e
39 40 41	590	Where:
42 43	591	Y: Outcome variable (CMDD-M score, prevalence of patients achieving the maximum score on
44 45	592	CMDD-M, PIMCH-Q score, or the number of non-adherence instances to medication changes
46 47	593	persisting post-discharge)
48 49 50	594	$b_0$ : Intercept, representing the expected value of the outcome variable (Y) at baseline (T = 0 and I =
50 51 52	595	0).
53 54	596	$b_1$ : Time effect, indicating the change of the outcome variable (Y) for each day passed, regardless of
55 56	597	the intervention.
57 58	598	T: Time in days passed from the start of the study, capturing natural changes in the outcome over
59 60	599	time.

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3 4	600	$b_2$ : Intervention effect, representing the difference in the outcome variable (Y) between pre-
5 6	601	intervention (I = 0) and post-intervention (I = 1) periods, after accounting for time trends.
7 8	602	I: Dummy variable indicating whether the observation was collected before (0) or after (1)
9 10	603	intervention, enabling comparison outcomes before and after the intervention.
11 12 13 14	604	e: Error term, capturing random noise or unexplained variation in the outcome variable (Y).
15 16	605	This model will allow us to investigate whether there is an immediate effect following the
17 18	606	intervention. Results will be presented as regression estimates with 95% CI and p-values. This
19 20	607	analysis will be conducted for the following outcomes: CMDD-M score, prevalence of patients
21 22 22	608	achieving the maximum score on CMDD-M, PIMCH-Q score (the three dimensions separately and
25 24 25	609	total score), the number of non-adherence instances to medication changes persisting post-
26 27	610	discharge, and prevalence of patients who are fully adherent to medication changes.
28 29	611	Process evaluation
30 31	612	Quantitative data from the process evaluation will be presented with descriptive statistics by study
32 33 34	613	group and in total. No formal statistical tests will be performed.
35 36 37 38	614	Public and patient involvement
39 40	615	Two public representatives were involved in our research team throughout the intervention
41 42	616	development process: CB, who holds political duties advocating for patients, and UE, who serves as
43 44 45	617	the chairperson of an association for relatives of older patients. Both actively contributed to the
45 46 47	618	design and development of the intervention by attending research meetings and participating in
48 49	619	decision-making. Additionally, we engaged an advisory board comprising five public representatives,
50 51	620	all of whom are either members of senior associations or have experience as patients receiving
52 53	621	hospital care. This panel reviewed and provided suggestions to improve the wording of the consent
54 55 56	622	form for study inclusion and the PIMCH-Q sent to patients. They also played a key role in developing
57 58 59 60	623	the information package for intervention component 1, offering feedback on its design and content.

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3 4	624	ETHICS AND DISSEMINATION					
5 6 7	625	This study involves human subjects and the handling of sensitive personal health data. Although					
, 8 9	626	there is a risk associated with collecting sensitive patient data, we will minimise these risks by					
10 11	627	adhering to the General Data Protection Regulation (GDPR) [56], and the Declaration of Helsinki [57					
12 13	628	All participants will provide written informed consent before participation (Supplementary materia					
14 15	629	I). The study has been approved by the Ethical Review Authority in Sweden (registration no. 2023-					
16 17 19	630	03518-01 and 2024-04079-02).					
19 20	631	The aim of this intervention study is to evaluate whether a novel approach to medication-					
21 22	632	related discharge communication can improve patient care. The comparator chosen for this study is					
23 24	633	the current standard discharge process (care as usual), selected because it reflects the routine					
25 26 27	634	practices patients experience in the study settings and provides a relevant baseline for evaluating					
27 28 29	635	the intervention's impact. During the intervention period, in addition to the usual care, the					
30 31	636	intervention focuses on enhancing the quality of medication-related communication at discharge,					
32 33	637	involving patients and/or caregivers in discussions with HCPs, and offering a follow-up call after					
34 35 36	638	discharge to reinforce information retention. During the clinical pharmacists' follow-up phone calls					
37 38	639	with patients in the intervention group, new issues may be identified that need attention. If the					
39 40	640	pharmacist making the call is not the appropriate person to handle these issues, they will consult					
41 42	641	with another suitable HCP to ensure the problem is addressed.					
43 44 45	642	We plan to publish the results of the main trial and any sub-studies in international peer-					
46 47	643	reviewed open-access journals, as well as present them at national and international conferences.					
48 49	644	The trial is expected to result in multiple published manuscripts, contribute to at least one PhD					
50 51	645	thesis, and support improved implementation of current Swedish regulations for medication-rela					
52 53 54	646	discharge communication [35].					
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29 30 31 32	830		Figure legends			
33	831	α (Ν	ADD-M a point-based instrument using data from the patient's electronic health records			
34 35	832	βρι	MCH-O, a questionnaire to natients measuring their percentions of involvement in discharge medication			
36	833	com	munication and their confidence in post-discharge medication management.			
37	834	<sup>γ</sup> Da	ta on lasting medication changes from the patient's electronic health records are compared to pharmacy			
38	835	disp	ensing data collected 120 days post-discharge.			
39 40	836	<sup>δ</sup> Un	planned hospital revisits and medication-related readmissions up to 90 days post-discharge.			
41 42	837	CME	DD-M = complete medication documentation at discharge measure, HCPs = healthcare professionals,			
42 43	838	IMP	ACT-care = improved medication communication and patient involvement at care transitions, PIMCH-Q =			
44	839	patient involvement in medication communication at hospital discharge questionnaire				
45 46	640	rigu	<b>ire 1.</b> Schematic overview of the study design.			
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50 51	843	Figu	<b>IRE 2.</b> Overview of the IMPACT-care intervention, comprising four intervention components			
52	844	imp	lemented during patient hospitalisation and post-discharge.			
53 54 55 56	845		DECLARATIONS			
57 58 59 60	846	Ack	nowledgements			

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3 4	847	We thank the other members of the IMPACT-care research group and public representative group,					
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11 12 13	851	participated in the pilot studies, as well as Karin Svensberg, the clinical pharmacists, public					
14 15	852	representative panel, designers, and film crew who were involved in developing the information					
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18 19	854	Research Group (https://yqsr.org/) for inspiring us to develop the information package and data					
20 21 22	855	collection forms. Additionally, we acknowledge the students who contributed to various aspects of					
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25 26	857	Bsada, Harleen Cheema, Melina Khashi, Maryam Mohamed, Jessica Nordin, Carolina Ravn, Yamen					
27 28	858	Sabouni, and Cecilie du Thinh.					
29 30	859	The authors used ChatGPT 40 (OpenAI) to assist in polishing the language during the writing process					
31 32 33	860	All content was reviewed and edited by the authors, who take full responsibility for the final					
34 35	861	published article.					
36 37	862	Authors' contributions					
38 39	863	Contributions by each author according to the Contributor Roles Taxonomy (CRediT)[58]:					
40 41 42	864	conceptualisation: all authors; funding acquisition: KF, TK, EN, KJL, CB, and UG; project					
43 44	865	administration: HC, KF, VÖ, and UG; methodology: all authors; writing - original draft: HC; writing -					
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tualisation: all authors; funding acquisition: KF, TK, EN, KJL, CB, and UG; project
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& editing: all authors. All authors have read and agreed to the published version of the

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874 collection, analysis, interpretation of the data or the writing of the manuscript.

#### 875 Competing interests statement

876 The authors declare no competing interests.

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IMPACT-care	+ =	2) Preparation of medication-related discharge documentation.	
intervention (components conducted	1) Information package		4) Follow-up call to patients*
by clinical pharmacists)		3) Facilitation of discharge communicatio	n.
		•	
* Based on	the patient's preferen	ce, this may include thei	r informal caregiver.
IMPACI-care = impi Figure 2. Overview of the	roved medication comm IMPACT-care intervent	nunication and patient in tion, comprising four inte	volvement at care transitions ervention components implemented
	during patient hosp	italisation and post-disch	narge.
	2681x53	9mm (72 x 72 DPI)	

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a CMDD-M, a point-based instrument using data from the patient's electronic health records. β PIMCH-Q, a questionnaire to patients measuring their perceptions of involvement in discharge medication communication and their confidence in post-discharge medication management.

γ Data on lasting medication changes from the patient's electronic health records are compared to pharmacy dispensing data collected 120 days post-discharge.

δ Unplanned hospital revisits and medication-related readmissions up to 90 days post-discharge.
 CMDD-M = complete medication documentation at discharge measure, HCPs = healthcare professionals,
 IMPACT-care = improved medication communication and patient involvement at care transitions, PIMCH-Q = patient involvement in medication communication at hospital discharge questionnaire
 Figure 1. Schematic overview of the study design.

1809x1148mm (72 x 72 DPI)

### (Unofficial translation from documents in Swedish)

#### Consent form for patients in the control group

# Information for research participants (patients) regarding participation in a research project in Region Uppsala

We would like to ask whether you are willing to participate in a research project. This document provides information about the project and what participation entails.

#### What is the project about, and why am I being asked to participate?

The aim of the project is to improve the quality of, and patient involvement in, medication communication when patients are discharged from hospital. The goal is to increase patients' sense of security and adherence to their medication treatment, as well as reduce the need for unplanned healthcare visits. We are focusing on patients aged 65 years or older, as many in this group take several medications. The project is carried out on the ward where you are currently receiving care, which is why you are being invited to participate.

The research sponsor for the project is Region Uppsala. The sponsor is the organisation responsible for the project. The study has been approved by the Swedish Ethical Review Authority (approval number: 2023-03518-01).

#### What does participation in the project involve?

The project consists of a control period, where care is provided according to standard routine, followed by an intervention period where additional measures are implemented to improve the quality of and patient involvement in medication communication. You are being invited to participate in the control group, which means you will receive care according to standard routines and be asked to complete a questionnaire approximately one week after discharge from hospital. It focuses on the medication information you received, and how involved and secure you felt after returning home. It takes approximately 5–10 minutes to complete and can be sent to you by post or email, depending on your preference.

#### What will happen with my data?

The project will collect and register information about your medication treatment, medications collected from the pharmacy, and any need for healthcare after discharge. This data will be obtained from your electronic health record and the Swedish National Board of Health and Welfare's medication register, and collection will continue for four months after discharge. Your questionnaire responses will also be recorded. Your name will be replaced with a code, and only researchers involved in the project will have access to the code key (the code linked to your personal identity number), which will be stored in a passwordprotected digital file within Region Uppsala's secure network. All data processing and presentation of results will be handled by the research team and Uppsala University in a

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way that prevents identification of individual participants. For more information, please see the subheading *Handling of Personal Data* below.

Your participation is voluntary, and you may withdraw at any time without providing a reason. Choosing not to participate or withdrawing will not affect your future care or treatment. If you wish to withdraw, please contact the principal investigator (see below).

#### Possible risks and consequences of participation

You are covered by the patient insurance system, as with any healthcare service. We assess the risks of participating in this study to be low. Some participants may feel their privacy is affected, since information will be retrieved from electronic medical records and the prescribed drug register. Completing a questionnaire shortly after discharge may also feel burdensome.

#### How will I be informed of the results?

The study results will be published. If you wish, you may access the results once they are published in a scientific journal and in a more popular science format. You can request the results by contacting the principal investigator.

#### **Principal investigator contact**

Ulrika Gillespie, \*address\*, Phone: xxx, Email: xxx

#### Handling of personal data

All data will be handled in accordance with applicable confidentiality laws. Your information and responses will be stored in a database in a way that prevents unauthorised access. All physical data generated during the study will be stored for 10 years in a locked cabinet at Region Uppsala.

The data controller is Region Uppsala. Under the EU General Data Protection Regulation (GDPR), you have the right to access your data, correct any errors, request deletion, or restrict how your data is processed. To do so, contact Ulrika Gillespie (details above). The data protection officer can be reached at xxx or xxx. If you are dissatisfied with how your data is handled, you have the right to file a complaint with the Swedish Authority for Privacy Protection.

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#### Consent to participate in the project

I have received verbal and/or written information about the study and have had the opportunity to ask questions. I will retain the written information.

I consent to participate in the project IMPACT-care: Improved medication communication and patient involvement at care transitions

I would like to complete the questionnaires digitally.

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### Consent form for patients in the intervention group

# Information for research participants (patients) regarding participation in a research project in Region Uppsala

We would like to ask whether you are willing to participate in a research project. This document provides information about the project and what participation entails.

### What is the project about, and why am I being asked to participate?

The aim of the project is to improve the quality of, and patient involvement in, medication communication when patients are discharged from hospital. The goal is to increase patients' sense of security and adherence to their medication treatment, as well as reduce the need for unplanned healthcare visits. We are focusing on patients aged 65 years or older, as many in this group take several medications. The project is carried out on the ward where you are currently receiving care, which is why you are being invited to participate.

The research sponsor for the project is Region Uppsala. The sponsor is the organisation responsible for the project. The study has been approved by the Swedish Ethical Review Authority (approval number: 2023-03518-01).

### What does participation in the project involve?

The project consists of a control period, where care is provided according to standard routine, followed by an intervention period where additional measures are implemented to improve the quality of and patient involvement in medication communication. You are being asked to participate in the latter phase of the project, during which the following elements will be added:

- 1. A clinical pharmacist on your ward will review your medications before you leave the hospital. The aim is to summarise changes made to your medication treatment during your hospital stay. This information will be documented in your medical record and support the physician responsible for providing written information (the medication list and discharge summary), as per routine, to you and your next healthcare provider before discharge.
- 2. You and your informal caregiver (if applicable) will receive an information brochure and access to an informational video while you are on the ward. These are designed to help you prepare for discharge and include tips on what to discuss with healthcare staff.
- 3. If you have an informal caregiver you would like to be informed about your medication changes, the pharmacist can help make arrangements for them to participate (in person or by phone/video call) in the conversation with the physician before you leave the hospital.
- 4. Before discharge, you will be offered a follow-up phone call with a pharmacist from the ward. This call will be scheduled for approximately one week after discharge. The purpose is to go through the written information (the discharge summary) you received and clarify any uncertainties.
- 5. About one week after your discharge, you will be asked to complete a questionnaire. It focuses on the medication information you received, and how involved and secure

 you felt after returning home. It takes approximately 5–10 minutes to complete and can be sent to you by post or email, depending on your preference.

#### What will happen with my data?

The project will collect and register information about your medication treatment, medications collected from the pharmacy, and any need for healthcare after discharge. This data will be obtained from your electronic health record and the Swedish National Board of Health and Welfare's medication register, and collection will continue for four months after discharge. Your questionnaire responses will also be recorded. Your name will be replaced with a code, and only researchers involved in the project will have access to the code key (the code linked to your personal identity number), which will be stored in a passwordprotected digital file within Region Uppsala's secure network. All data processing and presentation of results will be handled by the research team and Uppsala University in a way that prevents identification of individual participants. For more information, please see the subheading *Handling of Personal Data* below.

Your participation is voluntary, and you may withdraw at any time without providing a reason. Choosing not to participate or withdrawing will not affect your future care or treatment. If you wish to withdraw, please contact the principal investigator (see below).

#### Possible risks and consequences of participation

You are covered by the patient insurance system, as with any healthcare service. We assess the risks of participating in this study to be low. Some participants may feel their privacy is affected, since information will be retrieved from electronic medical records and the prescribed drug register. Completing a questionnaire shortly after discharge may also feel burdensome.

A possible benefit is that we might identify issues that can be communicated to the hospital physician. Additionally, receiving a follow-up phone call one week after discharge may be helpful, as previous studies show that questions often arise after leaving hospital. These questions can be addressed directly during the call or forwarded to the responsible physician.

#### How will I be informed of the results?

The study results will be published. If you wish, you may access the results once they are published in a scientific journal and in a more popular science format. You can request the results by contacting the principal investigator.

#### **Principal investigator contact**

Ulrika Gillespie, \*address\*, Phone: xxx, Email: xxx

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#### Consent to participate in the project

I have received verbal and/or written information about the study and have had the opportunity to ask questions. I will retain the written information.

I consent to participate in the project IMPACT-care: Improved medication communication and patient involvement at care transitions

I would like to complete the questionnaires digitally.

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# How to use this brochure

When staying in a hospital, many things happen, and it may be difficult to understand or feel comfortable with everything that takes place.

This information brochure is designed to support you and your
relatives in gaining more knowledge about your care during your
hospital stay and after you return home.

12
13 It is divided into four sections and includes information and
14 suggested points to discuss with healthcare staff or your relatives.

You can mark the points you would like to discuss with the
healthcare staff. You can also write down your own questions.

## My hospital stay

2 My medications

## **3** Preparing to go home (discharge)

## Advice for when I am home

Scan with a mobile camera for an informative film





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To be able to take care of your own health and manage your medication treatment when you return home, it helps if you have knowledge of what has happened during your hospital stay.

You can get this knowledge by:

- Talking to the healthcare staff about what is happening and asking if there is anything you are unsure about.
- Asking to be included in discussions about your care and medication treatment.

#### Points I would like to discuss

Mark the points you would like to discuss and/or write down other questions.

- What have I been treated for during my hospital stay?
- What is the plan for my care while I am still in the hospital?
- What is the plan for my care after I leave the hospital?
- What kind of help and support can I receive when I get home?
- How can my relatives help me?

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It is common for medication changes to occur during a hospital stay, and it can be challenging to keep track of them.

You can ask healthcare staff about your medications. You can also discuss how to take them at home and whether you need any practice.

#### Points I would like to discuss

Mark the points you would like to discuss and/or write down other questions.

- What medications am I taking and why?
- How and when should I take my medications, and are there any special considerations?
- What changes were made to my medication during my hospital stay, and why?
- What effects can I expect from my new medications?
- What side effects should I be aware of?
- Where should I turn if I have questions or experience problems with my medications?
- Can I practice taking my medications (e.g., injections or inhalers) while in the hospital?
- What support is available if I need help with my medications at home?

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# Preparing to go home (discharge)

Discharge means it is time to leave the hospital, and there may be a lot of information for you and your relatives to discuss. This information is meant to help you understand what to expect when you return home and how to get help if needed.

Before leaving the hospital, you have the right to receive this information.

- **Discharge conversation:** A discussion with a doctor about what has happened during your hospital stay and the plan moving forward. It can be helpful if a relative is present.
- **Discharge summary with a medication report:** Written information about your hospital stay, changes made to your medications, and the next steps in your care. Read and keep the summary and show it to your relatives if needed.
  - **Medication list:** A written list of the medications you should continue taking at home. Use this list and discard old ones.

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Review this checklist with healthcare staff to ensure everything is in order before leaving the hospital.

I know which symptoms to watch for.

- I know which medications to take when I get home and how to take them.
- I know where to go for prescription renewals.
- I know where to turn if I feel worse or have questions about my medications.
- I know how home care services or home nursing will assist me with my medications (if applicable).
- I know what follow-up care is planned for me.
- I have received my discharge summary.
- I have received my updated medication list.
- I have had a discharge conversation with a doctor.

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## My medications

- If you have future questions about your medications, contact a pharmacy or your healthcare provider.
- If you forget which changes were made to your medications, check the discharge summary and medication list.
- The discharge summary and medication list from the hospital • are also available in your medical records at 1177.se. You can also contact your healthcare center to obtain this information again.
- Always use the latest medication list provided by the hospital or your healthcare center. The list from a pharmacy may not include all recent changes, so do not rely on it.
- Unused medications should be returned to a pharmacy. •
- Remember to renew your prescriptions in time.

### Seek help if you feel worse

- Call 112 or go to the nearest emergency room if you fear you are experiencing something serious or life-threatening.
- You may still feel symptoms when you first return home. Contact vour healthcare center or call 1177 if the symptoms persist, worsen, or if new symptoms arise.
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# Complete Medication Documentation at Discharge Measure (CMDD-M)

(Unofficial English version, translated from Swedish)

Item	Discharge letter (intended for the patient)	Points			
1	The discharge letter includes a description of medication changes	0-1			
	- 0 points: No				
	- 1 point: Yes				
2	<b>All</b> medication changes are explicitly* stated ( <i>including duration/end date if time-limited</i> )	0 or 2			
	<ul> <li>0 points: No</li> <li>2 points: Yes</li> </ul>				
3	Reasons for all medication changes are stated	0-2			
	<ul> <li>2 points: The reason for all changes is included</li> <li>1 point: The reason for at least one change is included</li> <li>0 points: No reasons are stated <ul> <li>Automatically scored 0 points if item 2 is scored 0</li> </ul> </li> </ul>				
Discharge summary (intended for the next healthcare provider)					
4	Information about medication treatment is included in the discharge summary (sufficient if medications at discharge are listed, or if it is stated that medication changes have been made) - 0 points: No - 1 point: Yes	0-1			
5	All medication changes are stated	0-2			
	<ul> <li>2 points: All medication changes are explicitly* stated</li> <li>1 point: All changes are stated in a general** way</li> <li>0 points: At least one change is missing, or incorrectly stated</li> <li>0 Automatically scored 0 points if item 4 is scored 0</li> </ul>				
	Referral				
6	A referral is sent to the next healthcare provider	0-1			
	<ul> <li>0 points: No referral and medication changes were made</li> <li>1 point: Yes, or no referral needed (no medication changes made)</li> </ul>				
	Total	0-9			

\* Explicitly: For initiation and changes, state the medication name, strength, dose, dosage, and dosage form. For discontinuation state the medication name.

\*\* General: For example, "Pain relief treatment initiated".

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### Standard Operating Procedure (SOP) for using the CMDD-M

#### General Guidelines for Assessment

#### **Identifying medication changes**

- Medications at admission: Check the historical medication list from the day of admission. (Note: Admission could have been in another department.)
- Medications at discharge: Check the historical medication list from the day of discharge.
- Not considered a change:
  - Medications added or removed from the medication list during a medication reconciliation at admission (these are corrections, not changes) as noted in the doctor's or pharmacist's note.
  - Over-the-counter creams that can be purchased without prescription, regardless of the change made.
- Examples of how to assess combination preparations:
  - If Ramipril Comp is discontinued and Ramipril is initiated, this counts as 1 discontinuation and 1 initiation.
  - If two separate medications are switched to a combination preparation this counts as 2 discontinuations and 1 initiation.

#### Item-Specific Guidelines for Assessment

#### Items 2 and 5

- For initiation or changes to a medication, then name, strength, dose, dosage, and dosage form must be explicitly stated.
- For discontinuation, only the name must be stated.
- Medications prescribed solely for use during the hospital stay do not need to be included, such as intravenous antibiotics, insulin, infusion fluids, and similar medications.

#### Item 3

- The reason for a medication change may be acceptable if stated in general terms such as "for the heart", depending on the recipient.

#### Item 5

- Examples of general ways to state medication changes include:
  - o "Blood pressure medication reduced"
  - "Pain relief treatment initiated"
- Simply stating "new medications prescribed" is not sufficient.

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(Unofficial English version, translated from Swedish)						
Items	l strongly disagree	I disagree	l agree	l strongly agree	Don't know	
While in hospital						
1. I felt involved in decisions about my medication treatment that would continue after discharge (e.g., which changes would be made).						
2. I was offered the opportunity to have an informal caregiver present during the discharge consultation.						
3. I felt involved in decisions about the follow-up of my medication treatment.						
After returning home		-				
4. I (and/or my informal caregiver) know what changes were made to my medication treatment in the hospital (e.g., new medications, medications I should no longer use, or changes in dosage).	6	ien				
5. I (and/or my informal caregiver) know why my medication treatment was changed in the hospital (e.g., due to newly discovered atrial fibrillation or high blood pressure).			27			
6. I feel confident that I (and/or informal caregiver) can manage my medication treatment.						
7. I (and/or informal caregiver) know where to turn if I have questions about my medication treatment.						
8. I (and/or my relative) know how my medication treatment will be followed up.						

# Patient Involvement in Medication Communication at Hospital discharge Questionnaire