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Monitoring low-value care in medical patients from Swiss university hospitals using a Findable, Accessible, Interoperable, Reusable (FAIR) national data stream and patient and public involvement: LUCID study protocol

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ABSTRACT

Introduction Healthcare practices providing minimal or no benefit to recipients have been estimated to represent 20% of healthcare costs. However, defining, measuring and monitoring low-value care (LVC) and its downstream consequences remain a major challenge. The purpose of the National Data Stream (LUCID NDS) is to identify and monitor LVC in medical inpatients using routinely collected hospital data.

Methods and analysis This protocol describes a multistep approach to the identification and surveillance of LVC: (1) creating an NDS based on Findable, Accessible, Interoperable, Reusable (FAIR) principles using routinely collected hospital data from medical inpatients who signed a general consent for data reuse from 2014 onwards; (2) selecting recommendations applicable to medical inpatients using data from LUCID NDS to develop a comprehensive and robust set of LVC indicators; (3) establishing expert consensus on the most relevant and actionable recommendations to prevent LVC; (4) applying the Strength of Recommendation Taxonomy methodology to assess the level of evidence of recommendations; (5) involving patients and the public at various stages of LUCID NDS; and (6) designing monitoring rules within the LUCID NDS and validating quality measures.

Ethics and dissemination The ethics committees of all five participating university hospitals (Basel, Bern, Geneva, Lausanne and Zurich) approved LUCID NDS as a national registry on quality of care. We will disseminate our findings in peer-reviewed journals, at professional conferences, and through short reports sent to participating entities and stakeholders; moreover, lay summaries are provided for patients and the broader public on our webpage (www.LUCID-nds.ch).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Low-value care (LVC) in medical hospitalised patients, a National Data Stream (LUCID NDS) will facilitate nationwide collaborative research on LVC using Findable, Accessible, Interoperable, Reusable (FAIR) principles.
⇒ LUCID NDS will consist of existing clinical data from medical hospitalised patients in five Swiss university hospitals that have signed a general consent for data reuse from 2014 onwards.
⇒ We describe a multistep approach to identify, select and assess the evidence of LVC recommendations that could be derived from data of LUCID NDS.
⇒ Establishing expert consensus on the most relevant and actionable recommendations to prevent LVC in hospital will allow recommendations to be prioritised and monitored.
⇒ Patient and public involvement is one of the highest priorities of LUCID NDS and it is an innovative strategy to tackle LVC.

INTRODUCTION

A comprehensive and robust set of low-value care for medical inpatients in Switzerland

Low-value care (LVC), defined as healthcare practices providing minimal or no benefit to recipients, has been estimated to represent 20% of healthcare costs.[1–4] The past decade has seen the emergence of Choosing Wisely (www.choosingwisely.org) and the 'do not do' recommendations of Smarter Medicine in Switzerland (www.smartermedicine.ch), which are both large-scale international and national initiatives. Their goal is to develop, disseminate and implement recommendations to reduce LVC and reduce health-related costs and outcomes.[5–9]

Transforming these recommendations into a comprehensive set of indicators that can be monitored and made publicly available is key to improving quality of care. A practical challenge, when transforming complex recommendations to reduce LVC into measurable

metrics, is that a considerable proportion of these recommendations is not adequately quantifiable using standard hospital data that are routinely collected.[10–13] It is therefore often easier to focus on tests, procedures or interventions that are directly coded (eg, using International Classification of Diseases (ICD-10) or Anatomical Therapeutic Chemical Classification System (ATC)) rather than real treatment processes or diagnosis paths.[5 14–16] Finally, the evaluation of treatment success in terms of the values, needs and preferences of patients has been largely overlooked in Choosing Wisely initiatives, and it remains a major challenge.[17]

Patient values, needs and preferences regarding indicators of low-value care

In healthcare, an increasingly acknowledged notion is that 'less' can be of greater value, as an excessive use of medical tests and interventions can potentially compromise safety, efficiency and quality of care.[14] So far, studies on LVC have focused predominantly on medical perspectives,[18] while recent studies suggest that patient understanding of LVC goes beyond the medical balance of harm, benefit and costs.[19]

A mixed-methods study on Choosing Wisely initiatives found that the involvement of patients and families in the development of recommendations was minimal, with only six out of 136 (4%) reporting such involvement.[17] Patient and public involvement and engagement (PPIE) is thus an important next step for increasing uptake of recommendations to reduce LVC.[20] It is therefore a priority to develop more effective strategies to integrate the perspectives of all stakeholders in the healthcare system, including patients and the public (as potential future patients or close relatives), in decision-making and policy development on recommendations to reduce LVC. To this end, the Choosing Wisely initiative and the American Society of Hospital Medicine have recently published a priority list of LVC recommendations co-created by clinicians and patients.[21]

OBJECTIVES

The aims of LUCIS NDS on quality of care in Swiss university Hospitals (www.LUCID-nds.ch) are:

1. Creating an NDS based on Findable, Accessible, Interoperable, Reusable (FAIR) principles using hospital data routinely collected from medical inpatients who have signed a general consent for data reuse from 2014 onwards and using innovative approaches and data linkage.[22]
2. Selecting recommendations applicable to medical inpatients, by using data from the LUCID NDS to develop a comprehensive and robust set of LVC indicators.
3. Establishing expert consensus on the most relevant and actionable recommendations to prevent LVC.
4. Applying the strength of recommendation taxonomy (SORT) methodology to assess the level of evidence of recommendations.
5. Involving patients and the public at various stages of the LUCID NDS.
6. Designing monitoring rules within the LUCID NDS and validating quality measures.

METHODS

Creating LUCID National Data Stream (NDS)

In Switzerland, efforts to monitor LVC have been hindered by the absence of a nationwide database capable of identifying LVC in hospitalised patients.[23] Since 2017, the Swiss Personalized Health Network (SPHN) has developed a framework to ensure semantic interoperability through data standardisation in various Swiss hospitals.[24] To facilitate nationwide collaborative research, a strategy based on the FAIR principles has been adopted.[22 25] Data representation has been achieved through the creation of a semantically coherent dataset, where data are encoded in a multidimensional format using international standards including Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT), Logical Observation Identifiers Names and Codes (LOINC), Anatomical Therapeutic Chemical (ATC) and International Classification of Disease (ICD-10).[26] NDS, larger multicentric registries developed under the SPHN initiative,[27] create a multidisciplinary research consortium investing in the development of a sustainable data infrastructure for high-end, data-driven and personalised health research. In the long term, NDS are intended to serve as models for future research programmes and clinical applications of personalised health. In addition, all NDS include a PPIE strategy.

The aim of LUCID is to build an NDS to monitor and study the quality of care in Swiss university hospitals, especially in practices with little or no clinical value. To this end, it will integrate existing routine clinical data from consenting medical adult inpatients from 2014 onwards, complemented by information obtained through standardised, validated questionnaires completed by patients during their hospital stay. The prospective collection of patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) began in 2023. All data are pseudonymised and de-identified following a de-identification policy. Details of data extraction and flow can be found in the full registry description (online supplemental annex I).

The ethics committees of all five participating university hospitals (Basel, Bern, Geneva, Lausanne and Zurich) approved LUCID NDS as a national research registry on quality of care.

Selecting recommendations applicable to medical inpatients using data from LUCID National Data Stream (NDS) to develop a comprehensive and robust set of low-value care indicators

As the first methodological step of LUCID NDS, we selected recommendations to reduce LVC and to develop a comprehensive and robust set of indicators. Accordingly, we first selected a list of evidence-based recommendations to reduce LVC that are applicable to the

medical inpatient setting. We then identified which of these recommendations could be quantified into indicators. We describe the steps performed between December 2022 and November 2023 in more detail in the following sections.

Selecting low-value care recommendations

Using three different international sources (Choosing Wisely Canada; Choosing Wisely USA; and Smarter Medicine Switzerland-Choosing Wisely Switzerland), we selected a list of LVC recommendations published up to June 2023.[21 28–30] Two authors (TG and MM) reviewed the recommendations to reduce LVC, in order to select those that targeted patients over the age of 18 years and were applicable to the medical inpatient setting. To be applicable to adult inpatients, LVC and their related recommendations had to focus on diagnostic procedures, treatment and care processes that are used in medical departments and can be delivered by healthcare professionals. Consequently, surgical interventions, typical outpatient examinations and gynaecological and psychiatric recommendations were excluded. Initial disagreements among the reviewers on the selection were settled by discussions until a consensus was reached.

Applying methods to transform and operationalise recommendations into quantifiable low-value care indicators

The process was carried out in several steps. First, a panel of four experts in hospital databases and medical informatics met to discuss the feasibility of quantifying the recommendations for reducing LVC using the LUCID dataset (online supplemental annex II). The meeting consisted of a voting system held using three different coloured cards to categorise each recommendation as 'quantifiable', 'to be discussed' or 'not quantifiable'. Consensus was defined as a minimum of three out of four responses in agreement.

To ensure that the set of Choosing Wisely indicators was comprehensive, robust and valid, that is, accurate and generalisable, we used previously published methods.[12 31–35] Three authors (TG, JE and MD) coded the recommendations, determining for each one: the denominator, numerator,[5 13 36] exclusion criteria and direction.[10 12 14] Next, two definitions (sensitive and specific) were established for each quantifiable LVC recommendation to account for inaccuracies inherent in translating verbal recommendations into quantifiable, administrative hospital data. The sensitive definition aimed to capture as many LVC recommendations as possible, with the risk of including appropriate care. The specific definition captured inadequate care only, with the risk of excluding some LVC.

Establishing expert consensus on the most relevant and actionable recommendations to reduce or prevent low-value care

To prioritise the most relevant and actionable, quantifiable and evidence-based recommendations to reduce or prevent LVC applicable to medical inpatients, we created a multi-institutional approach including general internal medicine (GIM) physicians as experts. In Switzerland, hospitals have very large GIM units where patients with multiple comorbidities and more than one diagnosis are admitted. They are cared for by GIM doctors, who only consult other medical specialties for complex cases or disease-specific questions.

Using a one-round modified Delphi method, we asked experts from various Swiss hospitals (both regional and university hospitals, ranging in size from 50 to 2000 beds) and from different parts of the country (the French, German and Italian-speaking regions) to rank these recommendations based on their clinical relevance and anticipated ease of adherence. The selection of participants was deliberate, with emails sent to doctors working in different regions of Switzerland.

A voting survey was created by two authors (TG and MM), online in REDCap, and sent via email to elicit experts' opinions on the LVC recommendations. The authors (TG and MM) were not involved in the decisions made by the consensus panel in the modified Delphi study. Each recommendation was evaluated using a 5-point Likert scale based on the following criteria: (1) the clinical relevance of the recommendation for the medical inpatient setting and (2) the ease of adhering to the specific recommendation. Physicians who did not respond to the survey received a single reminder.

Our ultimate goal was to end up with a top-10 list of the most relevant and actionable LVC recommendations, which were selected using the sum of the relevance and ease scores, weighted by multiplying the relevance score by 2 (worst possible score, 0 points; best possible score, 15 points). This research was conducted ensuring compliance with the Accurate Consensus Reporting Document checklist (online supplemental material: annex III).[37]

Applying the strength of recommendation taxonomy methodology to assess the level of evidence of recommendations

Using the SORT methodology and a non-systematic literature review last updated in November 2023, two authors (TG and JE) established the level of evidence of the selected recommendations.[38] The SORT methodology evaluates evidence, based on three aspects: quality, quantity and consistency.

It then classifies recommendations into three categories: level A recommendations are drawn from consistent, high-quality, patient-focused evidence; level B recommendations arise from inconsistent or lower-quality patient-focused evidence; and level C recommendations are based on consensus, standard practices, or evidence that may be less reliable.

SORT methodology has previously been used for the validation of Choosing Wisely recommendations.[39 40] For the search of evidence, citations provided on the websites of Smarter Medicine Switzerland-Choosing Wisely Switzerland and of Choosing Wisely Canada[28 29] were used, and a non-systematic search on PubMed was performed.

The authors ranked the recommendations on a scale of evidence from A to C; and disagreement was resolved by discussion and consensus.

Involving patients and the public at various stages of LUCID National Data Stream (NDS)

PPIE is one of the highest priorities of LUCID NDS and it is an innovative strategy to tackle LVC. We therefore plan to involve patients at various stages of LUCID NDS.

Establishing a patient and public research panel of LUCID National Data Stream (NDS)

Ideally, the panel should consist of between 10 and 15 members who are multilingual and multicultural to reflect Switzerland's diversity. Therefore, members of the panel will differ in their healthcare experiences, professional background, education, origin, gender and age. Patients should have at least one chronic disease and/or the experience of at least one hospitalisation in medical acute care. The panel will help identify opportunities for wider patient involvement, engagement, and co-production activities and will carry out further tasks, such as:

- Reviewing research protocols to make sure that studies are relevant, impactful, informative and tailored to the needs and interests of people living in Switzerland.
- Co-redacting/co-editing lay summaries for each new phase of our research project.
- Recruiting new panel members.
- Reviewing manuscripts in order to make suggestions for lay dissemination of results.
- Reviewing scientific PPIE section in manuscripts.
- Giving feedback regarding communication strategy (such as newsletters and media coverage).
- Panel members attending a symposium, congress or monitoring meeting.
- Co-reporting on PPIE activities and evaluating the PPIE impact.
- Supporting in co-applications for new phases of our research.

Involving patients in drafting plain-language versions of the selected low-value care (LVC) recommendations via 'thinking aloud' sessions

We worked with patient contributors to develop lay explanatory text for key recommendations and to ensure that they were understandable and relevant from a patient perspective, with the intention of making them publicly available. For this task, four patients contributors were recruited from the LUCID Patient and Public Research Panel.

To develop lay explanatory texts, we held 'thinking aloud' sessions with a group of four patients selected by their availability, conducted to evaluate the clarity and effectiveness of selected recommendations. The 'thinking aloud' technique is a qualitative research technique, in which participants express their thoughts, feelings, and actions verbally and as they occur, while performing a task.[41]

Initially developed in English and taking inspiration from existing patient resources,[28] the texts on recommendations were reviewed by two authors (CEA and MM) and translated into French and German, first using the online translator DeepL.[42] These translations were then revised by native speakers to check their accuracy. 'Thinking aloud' sessions of 90 min each took place online (using Webex) between September and October 2023, with patient partners who speak different languages (English, French and German) to evaluate the translations and ensure consistency across the lay recommendations for reducing LVC. Patients verbalised their thoughts during the review of each recommendation, allowing us to gather real-time feedback.

The sessions were carried out by one male and one female author (TG and MJC), both with experience in qualitative research, following the same written canvas (online supplemental annex IV). The sessions were recorded, with the consent of the participants, to enable accurate content analysis. Qualitative data were collected and analysed following the Consolidated criteria for Reporting Qualitative research checklist, to ensure rigorous reporting of qualitative research (Supplementary material: Annex V).[43]

Collecting patient-reported outcomes and measures

To capture patient perspectives on their health, quality of life and care experiences, we will collect generic PROMs and PREMs in a subgroup of patients. We will study multimorbid medical hospitalised patients from admission to 30 days postdischarge, focusing on their symptoms, quality of life and distress, as well as their experience. By evaluating trends and associations with LVC, we aim to inform future implementation and benchmarking efforts in Swiss healthcare. This study will provide insights into improving care quality and efficiency from the patient perspective.

The primary endpoints will be patient-reported symptoms assessed with the Edmonton Symptom Assessment System (ESAS-r),[44] quality of life measured using the European Quality of Life 5 Dimensions 5 Level (EQ-5D-5L) index[45] and distress measured using the National Comprehensive Cancer Network (NCCN) distress thermometer,[46] assessed at admission, at day 3, at discharge, and at 10 and 30 days postdischarge. To explore patient experience of quality and quantity of care during their stay, the research team designed a short questionnaire, using open, closed questions and fields for free-text comments to allow patients to report on their experience of care at the end of their hospitalisation. The design and development of this questionnaire were based on previously published questionnaires.[47]

The full study protocol of Trends of PROMs and PREMs in medical hospitalised patients is available at ClinicalTrials.gov.[48]

Designing monitoring rules within LUCID National Data Stream (NDS) and validating quality measures

The ongoing systematic collection, analysis and interpretation of routinely collected medical inpatient data, with the dissemination of the resulting information or analyses to those responsible for controlling healthcare quality, in particular the avoidance of practices providing minimal or no benefit to recipients, namely LVC, relies on previously published principles.[49] This step, necessary for deriving meaningful results and insights from LUCID NDS, will be performed from 2025 onwards.

Conducting quality checks to validate low-value care indicators

The creation of quality indicators using routinely collected hospital data poses significant challenges in terms of recording, storing, coding and granularity.[50 51] To address this challenge and ensure the quality of the LVC indicators, we will revise our quality indicators through rounds of adjudication with clinical experts.

Monitoring low-value care

The frequency of LVC over time will be assessed and compared across hospitals. The baseline characteristics analysed and trends will be presented graphically. We also plan to compare readmission rates and other secondary endpoints between patients with and without LVC, adjusting for confounders such as patient demographics and clinical characteristics.

ANALYSIS

Creating LUCID National Data Stream (NDS)

LUCID NDS will contain about 120 000 unique patients in total, who were hospitalised in one of the five participating university hospitals between 2014 and July 2024. Collected variables are: (a) demographic data (age, sex, site, date of admission and discharge, living setting prior to admission, insurance and socioeconomic status, hospital costs); (b) information related to LVC provision; (c) duration and type of hospital treatment, that is, medications at admission, during hospitalisation, and at discharge using ATC codes, and inpatient procedures, including surgical procedures, using Swiss Classification of Operations (CHOP) codes, employed to code medical treatments[52]; (d) comorbidities using ICD-10 codes; (e) vital signs, body height and weight; (f) laboratory data over the entire hospital stay using LOINC codes; and (g) a subset of 1000 patients will be sent questionnaires, that is, generic PROMs and PREMs. These PROMs and PREMs data will be available for analysis at the end of 2025, as data collection has not yet been completed.

A FAIR NDS schema is available for consultation at https://www.biomedit.ch/rdf/sphn-schema/lucid. Next necessary steps to be able to perform analyses and monitor LVC relate to data cleaning, selection and coding within LUCID NDS infrastructure. Moreover, further data transfer is planned to enrich LUCID NDS with recent data from 2024 and onwards, to allow ongoing and future monitoring of LVC.

Selecting recommendations applicable to medical inpatients using data from LUCID National Data Stream (NDS) to develop a comprehensive and robust set of low-value core (LVC) indicators

Analysing the four international sources, two authors (TG and MM) identified a list of 548 LVC recommendations. Of this total, 98 LVC recommendations were applicable to hospital medicine. After exclusion of 29 duplicates, 69 recommendations remained.

In the first round, 69 recommendations were analysed regarding the feasibility of quantifying these LVC recommendations using the available dataset (online supplemental annex II). Ultimately, 27 recommendations were rejected, and 42 were accepted as 'quantifiable' using routinely collected data. The second round of the session allowed for further discussion and clarification of the recommendations and the challenges and opportunities associated with their measurement. Two combined recommendations were split into two distinct principles (ie, recommendation about benzodiazepines and neuroleptic prescription), and three others previously defined as 'not quantifiable' were reconsidered, resulting in a total of 47 'quantifiable' recommendations (online supplemental annex VI; figure 1).

Establishing expert consensus on the most relevant and actionable recommendations to prevent low-value care

We sent then the voting survey containing 47 LVC recommendations by email to 92 physicians active in GIM departments on 6 June 2023 and gave them 3 weeks to complete the survey. Of those addressed, 35 completed the survey (making a response rate of 38%). Their clinical experience was 10.5 years on average and ranged from 4 to 30 years (table 1).

We then ranked the 47 recommendations, obtaining the highest combined scores by multiplying two times the score obtained on the 'relevance' scale and adding the score earned on the 'easiness to adherence' scale (figure 2). To ensure a more comprehensive coverage of our findings, we expanded the list from top 10 to top 15, taking into account two instances of tied rankings, as well as the scores and confidence intervals.

Combined scores ranged between 12.00 and 13.24 with the respective CIs. Details on the top-15 highest-ranking scores appear in table 2.

Applying the strength of recommendation taxonomy methodology to assess the level of evidence of recommendations

Recommendations were reviewed by two authors (TG and JE) and more information about their underlying evidence obtained from the literature (online supplemental annex VII). Using the SORT methodology, 80% of recommendations were considered level A evidence, 20% level B, and none level C. Studies included to support the

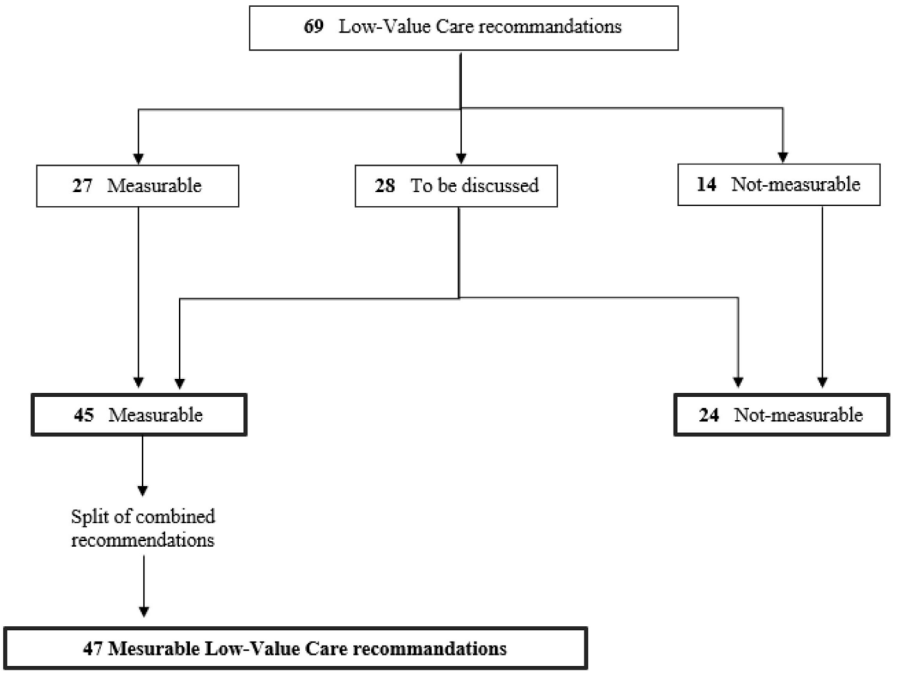

Figure 1 Selection process of low-value care recommendations.

evidence for a determined recommendation included patient-centred outcomes, such as subjective reports of sleep, variation in weight, or mortality.[53 54]

Involving patients and the public at various stages of LUCID National Data Stream (NDS

Setting up the patient and public research panel of LUCID National Data Stream (NDS)

The Patient and Public Research Panel was established in June 2023 to ensure that the patient and public voice was embedded in LUCID NDS. It is currently composed of seven members, 57% identifying as female. A document (online supplemental annex VIII) details the composition, selection process and tasks of the patient panel, which will meet quarterly to provide insights on new projects, review research protocols and actively participate in the dissemination of the research process.

The present study protocol has been reviewed and discussed with a patient contributor who is a native English speaker who also proposed adding a lexique and a lay summary (online supplemental annex IX).

Table 1 Characteristics of physicians participating in the Delphi survey

Survey participants	Total (n=35)
Senior physician	19 (55.9%)
Resident physician	15 (44.1%)
Years of medical experience (since graduation)	
Mean (SD)	18.5 (10.5)
Median (lower quartile, upper quartile)	14.0 (10.0, 28.0)
Category of hospital	
University hospital	27 (77.1%)
Regional hospital	8 (22.9%)
Language of region of activity	
German speaking	17 (50.0%)
French speaking	16 (47.1%)
Italian speaking	1 (2.9%)

*One answer was missing for the medical experience and for the language spoken.

Involving patients in drafting plain-language versions of the selected low-value core (LVC) recommendations

Texts of lay recommendations to reduce LVC were shown to four patient contributors individually. Patient contributors were male and female, 59 to 79 in age and mostly from the German-speaking part of Switzerland, with one from the French-speaking part. Education levels ranged from a vocational training qualification to a doctorate. They were native English, French and German speakers, so 'thinking aloud' sessions were performed in these three languages.

Patient contributions ranged from simple grammar correction to more detailed and in-depth comments on the form of expression or the accessibility of the texts. Based on their suggestions, we refined the texts, ensuring that they were understandable and culturally appropriate in each language. The results of the edited texts are available on request.

Collecting patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs)

We will study the association between PROMs at discharge and the risk of hospital readmission or emergency department visits within 30 days, and we will evaluate whether PROMs trends differ in patients receiving LVC versus those who do not. Accordingly, we will capture and graphically

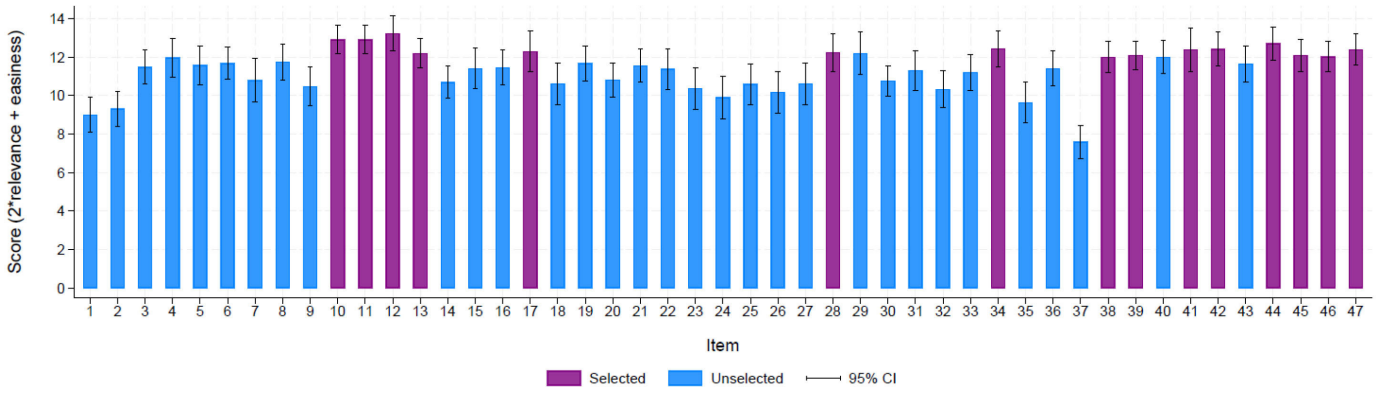

Figure 2 Physicians' ranking of 47 low-value care recommendations based on a score that integrates relevance and ease of adherence (scoring system: worst possible score 0 points, best possible score 15 points. CI included. In violet, the 15 best scores (with item 12 being the top 1).

represent the course of PROMs over time, showing means with 95% CIs. Moreover, we will use longitudinal latent class analysis to identify classes with similar ESAS-r trajectories over time. Baseline and procedural characteristics will be shown for classes of patients with similar ESAS-r trajectories over time as number and percentage, mean and SD, or median and quartiles, as appropriate, and compared using χ^2, t-tests or Kruskal-Wallis tests, respectively. Analysis will also be performed for EQ-5D-5L and distress thermometer and PREMs if appropriate.

Designing monitoring rules within LUCID National Data Stream (NDS)

We will identify LVC practices in five university hospitals in Switzerland. The results are likely to show trends over the past years, in the rise or fall of LVC. Despite this, differences between centres may be observed.

We also plan to disseminate the results of our study extensively, targeting both scientific and non-scientific publications, as well as by presenting our findings at various scientific conferences, both national and international. These conferences will be attended by researchers, public health professionals and the general public, allowing our research to reach a wide and varied audience. As for the authorship attribution, we will follow the guidelines set by the International Committee of Medical Journal Editors (www.icmje.org). Furthermore, we will adhere to established guidelines for reporting studies that use observational data.

Finally, the results of LVC monitoring will be individually transmitted to medical directorates of each participating hospital so that they can identify their LVC practices, target necessary quality improvements, and implement local quality improvement programmes.

DISCUSSION

Our study protocol describes the multiple challenges of identifying, measuring and monitoring LVC using hospital data routinely collected by hospitals and healthcare professionals. We successfully established a set of quantifiable indicators of LVC, considered evidence-based, by employing a validated and internationally recognised approach. Involving a multi-institutional panel of GIM physicians was crucial in identifying the 15 most relevant and actionable LVC recommendations. Our approach, which consists of defining indicators of LVCs using routinely collected hospital data and reaching consensus on which are most relevant and easy to adhere to in clinical practice, reflects an innovative implementation of several existing approaches and strategies.[55] Our work will therefore enable the quantification of LVC, using metrics derived from existing clinical data that are relevant to healthcare professionals and understandable to patients and the public.

Concerning the implication of healthcare professionals, it was indeed important both to understand which recommendations to reduce LVC need to be prioritised and how best to de-implement them in future.[56] Healthcare professionals play a key role in the de-implementation of LVC.[57] By involving physicians from different centres and regions, we wanted to ensure the generalisability of our recommendations for use in both university and non-university centres. In the outpatient setting, differences in awareness of LVC and its related recommendations were indeed previously found between primary care physicians and other specialists.[58]

To conclude, such a project would not be possible and relevant without the participation of patients contributors, who are the guarantee that such a large national research project remains in line with its ultimate goals: of reducing and preventing LVC and improving the quality of care. In fact, many people are not even aware that medical overuse can be directly harmful to patients. This limited awareness is an obstacle to tackling LVC effectively.[59]

By involving heterogeneous populations and providing the differing perspectives of healthcare providers and patients, we intend to account for these varying levels of awareness and adherence. In so doing, we aim to reduce barriers to their future implementation.

Strength and limitations

The FAIR design of LUCID NDS and the wide set of data being processed will make it possible to go beyond our

Table 2 Ranking of the 15 highest-scoring recommendations based on the voting survey

N°	Low-value care recommendations	Ranking scores		
		Relevance score	Ease of adherence score	Total score (2*relevance) + ease
		95% CIss		
12	A single unit of red cell transfusions is the standard of care for non-bleeding, hospitalised patients. Do not transfuse more than the minimum number of red blood cell (RBC) units to return a patient to a safe haemoglobin range (>70 g/L in stable non-cardiac inpatients and 80 g/L in stable patients with pre-existing cardiovascular disease).	4.62 (4.27 to 4.96)	4.00 (3.66 to 4.34)	13.24 (12.31–14.16)
11	Do not place urinary catheters for incontinence, convenience or monitoring of output for non-critically ill patients (acceptable indications: obstruction, irritative dermatitis).	4.82 (4.56 to 5.09)	3.26 (2.93 to 3.60)	12.91 (12.18–13.64)
10	Do not prescribe blood tests every day in the face of laboratory stability (sodium, potassium, calcium, creatinine, C-reactive protein, simple and complete blood count).	4.74 (4.46 to 5.01)	3.44 (3.06 to 3.82)	12.91 (12.16–13.66)
44	Do not prescribe benzodiazepines in older adults (>65 years) at discharge.	4.68 (4.37 to 4.98)	3.35 (2.96 to 3.75)	12.71 (11.83–13.58)
47	Do not systematically treat blood pressure values above the norm with antihypertensive drugs during an acute care hospitalisation.	4.68 (4.40 to 4.96)	3.03 (2.61 to 3.45)	12.38 (11.57–13.19)
42	Do not routinely prescribe venous thromboembolism (VTE) prophylaxis to all hospitalised patients; use an evidence-based risk stratification system to determine whether a patient needs VTE prophylaxis (risk stratification by using Geneva Simplified Score).	4.62 (4.31 to 4.93)	3.18 (2.76 to 3.59)	12.41 (11.53–13.30)
34	Do not recommend gastric tube feeding (nasogastric and PEG) in patients with severe dementia.	4.35 (3.99 to 4.72)	3.74 (3.29 to 4.18)	12.44 (11.50–13.38)
13	Do not use benzodiazepines or other sedative hypnotics in older adults (>65 years) or insomnia, agitation or delirium.	4.71 (4.41 to 5.00)	2.79 (2.45 to 3.14)	12.21 (11.44–12.97)
39	Do not wake patients at night for routine care (blood sample, drugs administration); redesign workflow to promote sleep at night.	4.74 (4.47 to 5.00)	2.62 (2.25 to 2.98)	12.09 (11.34–12.84)
45	Do not recommend routine or multiple daily glucose monitoring in adults with stable type 2 diabetes on agents that do not cause hypoglycaemia.	4.41 (4.10 to 4.72)	3.26 (2.87 to 3.66)	12.09 (11.25–12.92)
46	For moderate to severe acute pain, if opioids are used, it should be in conjunction with non-opioid methods with the lowest effective dose for the shortest required duration.	4.41 (4.11 to 4.71)	3.21 (2.89 to 3.52)	12.03 (11.25–12.81)
41	Do not order daily chest radiographs in hospitalised patients unless there are specific clinical indications.	4.03 (3.56 to 4.50)	4.32 (3.92 to 4.72)	12.38 (11.25–13.52)
28	Do not use NSAID in patients with hypertension, heart failure or chronic kidney disease.	4.21 (3.81 to 4.60)	3.82 (3.41 to 4.24)	12.24 (11.24–13.23)
17	Do not order CT pulmonary angiograms or VQ scans in patients with suspected pulmonary embolism until risk stratification with decision rule has been applied and, when indicated, D-dimer biomarker results are obtained.	4.35 (3.95 to 4.75)	3.59 (3.18 to 3.99)	12.29 (11.23–13.36)
38	Do not prescribe oxygen if SpO2>94% (unless treating for carbon monoxide poisoning, cluster headaches, sickle cell crisis or pneumothorax).	4.53 (4.24 to 4.82)	2.94 (2.51 to 3.37)	12.00 (11.19–12.81)

Scoring system: worst possible score 0 points, best potential score 15 points (based on a Likert scale of 1 to 5, using the sum of the relevance and ease scores, weighted by multiplying the relevance score by 2).
NSAID, non-steroidal anti-inflammatory drug; PEG, percutaneous endoscopic gastrostomy; SpO2, oxygen saturation; VQ, ventilation-perfusion.

current scope. It will be possible to calculate many other LVC indicators in the future, to conduct further studies on this important topic and even to establish collaborations with other research groups.

We acknowledge several limitations in our work, too. First, significant variation in the level of evidence of recommendations to reduce LVC has been reported. Interestingly, the higher the level of evidence, the higher the economic burden was found.[60] Despite the Grading of Recommendations Assessment, Development and Evaluation classification being one of the most widely recognised and used frameworks for defining the evidence level of recommendations,[61] its application is limited by its complexity and need for greater resources.[62] We therefore decided to use the SORT method, which has not only been validated in various

fields and used by some medical societies, but has also been used in relation to LVC.[38 39] However, because the SORT method does not require a systematic review, selection bias in the choice of the literature can occur. Using the SORT method was instrumental in guiding our research towards patient-centred recommendations, ensuring that our findings were based on both evidence and patient perspectives.[38] This approach not only meets the imperative of optimising the value of healthcare but also facilitates informed clinical decision-making, reinforcing the hypothesis that a higher level of evidence is essential to identify and reduce LVC.[63]

Second, involving the patient perspective remains a major challenge in research[64] and is hampered by communication barriers, time constraints and resource limitations.[65] Given the complexity of the topic, patients currently have a limited understanding of LVC. For this reason, we did not include the patient perspective in the selection and ranking of LVC recommendations. For example, in a survey conducted in Germany, more than half of the respondents had never heard of medical overuse.[59] These considerations emphasises the need for adequate resources, training and strategic planning to facilitate patient and public involvement. This limitation underlines an important area for future development: incorporating patient input to develop, prioritise, and implement strategies to reduce LVC.[19 21 66] Involving patients, not only in research, calls for a major investment of time and resources, but it is an opportunity to improve the way clinical research and quality improvement programmes are structured and planned, and to make them more relevant for patients. Second, the response rate from physicians asked to provide their expertise on the most relevant and actionable recommendations to reduce LVC was only 38%, and most respondents worked in academic centres and in GIM departments (table 1), which may not fully reflect the different hospital settings.

In conclusion, our project, which draws on both expert consensus and patient inputs, represents a balanced approach to tackle LVC in medical inpatient healthcare. It will contribute to the growing body of research on LVC by providing a first ever NDS in Switzerland and a pragmatic framework for the selection, implementation, and monitoring of a comprehensive and robust set of indicators of LVC.

Our findings will be a contribution to ongoing discussion on the improvement of the quality of healthcare by reducing LVC. Finally, our project also underscores the urgent need to adopt methodologies that prioritise patient-centred approaches in the evaluation and implementation of recommendations for reducing LVC and for related indicators. Involving physicians, other healthcare professionals (such as nurses, physical therapists, and other allied healthcare professionals) and patients in the dissemination of future results will be key to ensuring that health interventions are both effective and meet patient needs and expectations.

ETHICAL CONSIDERATIONS AND DISSEMINATION

LUCID NDS has formally notified the ethical commission of Canton Vaud (CER-VD n° AO_2023–00029) of its establishment as a national registry on quality of care, in accordance with local regulatory requirements. Inclusion in the study is limited to patients who have already provided general consent, as acknowledged by the ethical standards. The confidentiality and privacy of all participant information will be strictly maintained by project personnel (online supplemental annex I). Results from this study will be shared through publications in relevant peer-reviewed journals and showcased at suitable national and international workshops and conferences. The project includes a component of dissemination of results to a larger public; each dissemination strategy is discussed and will be validated by the LUCID executive board together with the panel of patient partners.

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Contributors TG acted as a guarantor. MM, TG, JE, DA, SB, JS, CAM and J-LR contributed to the design and implemented of the registry. J-BR carried out the statistical analysis for the prioritisation of low-value core. TG, M-JC and CEA designed and performed the 'thinking aloud' sessions and ensured their analysis. TG, JE and MD worked on the definition of the indicators. TG took the lead in writing the manuscript under the supervision of MM. All contributors and members of the LUCID Consortium and partner patients provided critical feedback and helped shape the registry, analysis and manuscript. AI was used as the translator to help authors translate sentences from their native languages.

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