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RESEARCH ARTICLE

The use of nurse-led care intervention to improve self-care abilities subsequently decreasing readmission in multimorbid hospitalized patients: A quasi-experimental study in a real-world setting

Lukas Faessler[1] | Sabine Kofler[1] | Juliane Wenke-Zobler[1] | Corinne Brunner[2] | Petra Schäfer-Keller[3] | Sabina De Geest[4,5] | Maria Schubert[4,5,6] | Katharina Regez[7] | Philipp Schuetz[7] | Beat Mueller[7] | Antoinette Conca[1]

[1]Department of Clinical Nursing Research and Development, Kantonsspital Aarau, Aarau, Switzerland

[2]Pediatric Skin Center, Skin- and Wound Management, University Children's Hospital Zurich, Zurich, Switzerland

[3]School of Health Sciences, University of Applied Sciences and Arts Western Switzerland HES-SO, Fribourg, Switzerland

[4]Department Public Health, Institute of Nursing Science, University of Basel, Basel, Switzerland

[5]Department of Public Health and Primary Care, Academic Center for Nursing and Midwifery, KU Leuven, Leuven, Belgium

[6]School of Health Professions, Institute of Nursing, University of Applied Sciences (ZHAW), Winterthur, Switzerland

[7]Division of General Internal and Emergency Medicine, Medical University Department, Kantonsspital Aarau, Aarau, Switzerland

Correspondence
Antoinette Conca, Department of Clinical Nursing Research and Development, Kantonsspital Aarau AG, Tellstrasse 25, Aarau 5001, Switzerland.
Email: antoinette.conca@ksa.ch

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Abstract

Aim: Nurse-led care aims to optimize the discharge preparation with a focus on increasing patients' independency and self-care abilities. This study compared patients' improvements of self-care abilities and frequency of readmission rate between nurse-led care and regular nursing care within the acute hospital setting.

Design: A quasi-experimental design within a real-world setting was used for this work.

Methods: We included a pool of 2501 patients from a control group (medically stable in usual care) and 420 patients from an intervention group (nurse-led care). After propensity score matching, the study cohort consisted of 612 patients.

Results: From admission to discharge, nurse-led care patients showed superior improvements of total self-care abilities compared to usual care patients. In particular, we found improvements in the following categories: mobility, grooming and excretion. Patients with nurse-led care were furthermore less frequently readmitted to hospital compared with the control group patients.

Patient or public contribution: No patient or public contribution.

KEYWORDS
hospital setting, intervention, nurse-led care, readmission, self-care ability

Lukas Faessler and Sabine Kofler contributed equally to this study.

1 | INTRODUCTION

1.1 | Background

Multimorbidity, defined as two or more co-occurring chronic diseases, has been identified as a major public health concern worldwide (Navickas et al., 2016; WHO, 2015). Due to rapid aging of the population and increased life expectancy, the prevalence of multimorbid patients has been increasing in the past decades (Uijen & van de Lisdonk, 2008; van Oostrom et al., 2016). The prevalence of multimorbidity is reported to be 15.3%–93.1% in the general population (Chua et al., 2021). In hospitalized patients, multimorbidity was detected in 50%–97% of medical inpatients (Schneider et al., 2012).

Multimorbid patients who are hospitalized have an increased risk for longer length of stay and the need for complex care and additional nursing requirements (Aubert et al., 2020; Doessing & Burau, 2015; Navickas et al., 2016). Research shows that waiting for discharge solutions, self-care deficits or decreased mobility are reasons for prolonged hospitalization (Covinsky et al., 2011; Parent et al., 2016; van Vliet et al., 2017).

Most healthcare systems are organized in a single-disease framework, which does not meet the needs and problems of multimorbid patients (Doessing & Burau, 2015). Various studies indicate that these needs can be met with interventions such as interdisciplinary geriatric care, functional maintenance programme or nurse-led interventions (Miani et al., 2014). It is also emphasized that models of care which reduce disability, subsequently improve self-care ability should be of high priority for hospitals and clinicians admitting older and multimorbid patients (Covinsky et al., 2011).

Whether a nurse-led care intervention can improve the self-care abilities of multimorbid patients in hospitals has not yet been studied.

1.2 | Nurse-led care

Research on nurse-led care (NLC) has increased over the previous years and has been used in various settings. NLC is provided by qualified nursing professionals within the course of treatment and focuses mainly on patient support at the post-acute care period (Jeffs et al., 2017; Wong & Chung, 2006).

Several studies investigated the feasibility and effectiveness of NLC. A meta-analysis of Griffiths, Edwards, et al. (2007) included 10 studies with a total of 1896 patients. Patients were referred to a nursing-led inpatient unit (NLU). NLU is a multifaceted intervention, and the core elements were professional substitution (nurse for doctor) and altered case mix of the unit. NLU is intended to enhance the quality and quantity of nursing care and is a substitute for medical care management of care. Compared to usual hospitalized care patients, NLU patients reported better well-being were more frequently discharged home and had reduced readmission rates within 30 days. In addition, findings of another study showed an improvement in patients' functional status and overall activities of daily living between referral to a nurse-led inpatient unit and hospital discharge (Harris et al., 2007). Further evidence also showed longer length of hospital stay based on NLC patients' complex healthcare needs (Griffiths, Foster, et al., 2007; Harris et al., 2007). These findings were further confirmed by a systematic literature review and meta-analysis which concluded that compared with standard care, early nurse-led discharge planning programmes had a positive impact on chronically ill inpatients such as reducing readmission rate, readmission length of stay, mortality and improving quality of life (Zhu et al., 2015). Nurse-led discharge programmes contain an initial nurse visit within 48 h of hospital admission, predischarge assessment, structured home visits and telephone follow-ups after discharge; led by a nurse and supported by a multidisciplinary team (Zhu et al., 2015).

Most of the studies conducted were based on randomized controlled trials; little attention has been paid to real word design. Real-world data are data associated with patient health, collected from sources other than randomized controlled trials (RCT) (Katkade et al., 2018). It provides valuable information in a more diverse patient population. Real-world design is important as it supplements data from RCTs (Suvarna, 2018). Furthermore, only a few studies investigated the effects on self-care abilities in association with NLC services, although it is known from various patient populations that a better self-care ability is related to improved quality of life. To evaluate the benefit of comparatively novel intervention such as NLC service, it is necessary to analyse their effectiveness and feasibility under real-world conditions.

1.3 | Study aims

The aim of this study is to investigate the effectiveness of NLC in a real-world setting in individuals with multimorbid conditions compared with usual care patients in terms of self-care abilities and readmission rate.

2 | METHODS

2.1 | Study design and setting

The current study used a quasi-experimental design and was part of the "Optimizing Triage and Hospitalisation In Adult General Medical Emergency Patients" (TRIAGE) project (Schuetz et al., 2015). It was conceived in 2010 as a quality development project by the interdisciplinary research team to optimize patients and care processes within the hospital setting. STROBE checklist for observational research was used to guide this study (Appendix S1). This project aimed to improve the patient pathways and discharge processes of patients presenting with an urgent medical need at a teaching hospital in Switzerland, a 600-bed tertiary-care hospital, accessible to the public with most medical admissions entering over

the emergency department (ED). Mean Length of hospital stay in Switzerland is 5.3 days (Swiss Health Observatory, 2020). After hospitalization, patients are discharged home, to a nursing home or to a rehabilitation clinic. If an inpatient rehabilitation stay is required after treatment, the costs are covered by the health insurance up to a maximum of 28 days. Despite the high density of rehabilitation centres in Switzerland, there is often a waiting time of up to 2–3 weeks, increasing the duration of the hospitalization.

2.2 | Study population

We consecutively enrolled patients seeking ED care for medical issues who met the following inclusion criteria: adult medical patients in whom an initial blood draw was done as part of the routine ED assessment. As 'medical patient', we defined a patient with an initial predominant medical health issue as judged by the triage nurse based on routine clinical care assessing triage priority according to the Manchester triage system. Surgical and paediatric patients were excluded. No other exclusion criteria were defined regarding main diagnosis or presenting symptoms to reflect the diversity and challenges of 'real life'.

2.2.1 | Intervention group

The intervention group consisted of consecutively admitted medically stable patients on all medical wards that were referred to the nursing experts and received nurse-led care in the period between December 2012 and January 2016. Based on the real-world design of this study, the initial position was a usual care treatment of hospital patients. NLC service was provided for patients who were medically stable (physician decision), but not able to be discharged because they were care-dependent or in a palliative state. After checking the eligibility and enrolment by the physicians and the nursing experts, patients were under the responsibility of the nursing services in delegation of the physician. This meant that nursing experts substitute the daily medical rounds. Physicians were only involved, if medical problems or questions (e.g. in terms of medication) emerged. The nursing rounds were conducted during working days, lasting for about 10–50 min. They were conducted by a nurse with a master's degree in nursing science or an equivalent education with professional experience in the field of medicine or by a nurse with an appropriate NLC-related training. For a detailed description of the NLC procedures, see Figure S1.

The structure and content of the NLC intervention was based on the following five experience and evidence-based NLC areas of nursing focus: (a) functional status, (b) self-management (c) patient/relative expertise, (d) emotional status and (e) everyday life (Wenke-Zobler et al., 2017). Patients were supported according to their priorities and goals, aiming at discharge to increase independence or improve abilities in activities of daily living (Brunner et al., 2015). Complementary to these assessments every patient was asked the following question: 'If you think about going home [or alternatively: your transfer to a rehabilitation etc.], what goes through your mind?' (Kate Lorig, personal communication, March 03, 2014). The answers were assessed, and interventions accordingly individualized. For the improvement of functional abilities, the nursing expert used the patients time allotted towards the ward round to walk with the patients and talk about their improvements and current care needs. The nursing expert coordinated the training with the physiotherapist and instructed the patient regarding simple strength-gaining exercises. Patients received a leaflet with instructions about possible exercises. Subsequently they were motivated to repeat these exercises whenever possible, if possible, assisted by their relatives. A comprehensive description of the intervention is presented in Figure 1 and Table S3.

2.2.2 | Control group

The control group who was matched by propensity score matching consisted of medically stable hospitalized patients not referred to nurse-led care and therefore with a usual care treatment between March and October 2013 included in the TRIAGE project (Schuetz et al., 2015). The above time period was selected due to data efficiency reasons. No changes in the mentioned time period about usual care was observed.

The usual nursing care was provided by accredited nursing professionals, health care assistants, nursing students and trainees under delegation. The control group received usual care which contained a daily nursing-assisted medical ward round and a standardized assessment of care needs. The stability of the medical condition was daily judged by physicians with a ward round tool, which was developed in the TRIAGE project that also contained nurses' records regarding patients' predefined discharge conditions (e.g. independency of mobility, climbing up the stairs or independency of activity of daily living) and relatives' discharge expectations. The physicians ordered further treatments if needed.

2.3 | Outcome measures

The primary outcome measure was self-care ability, which was assessed using the Self-Care Index (in German: Selbstpflegeindex, SPI). This instrument is part of the outcome-oriented nursing assessment AcuteCare (ePA-AC©). The total SPI score provides information about the patients' severity of need of care and comprises 10 items/subdimensions such as mobility, grooming (upper and lower body), nutrition, dressing (upper and lower body), excretion (urination and defecation) and cognition. Items are rated on a 4-point scale (1 = no ability, 4 = full ability) (Grosse Schlarmann, 2007). An improvement of total SPI score and its subscales indicate a higher independence. Results of a validation study showed that the nursing assessment ePA-AC has substantial interrater reliability (Cohen's kappa >0.6; Grosse Schlarmann, 2007). As a secondary outcome

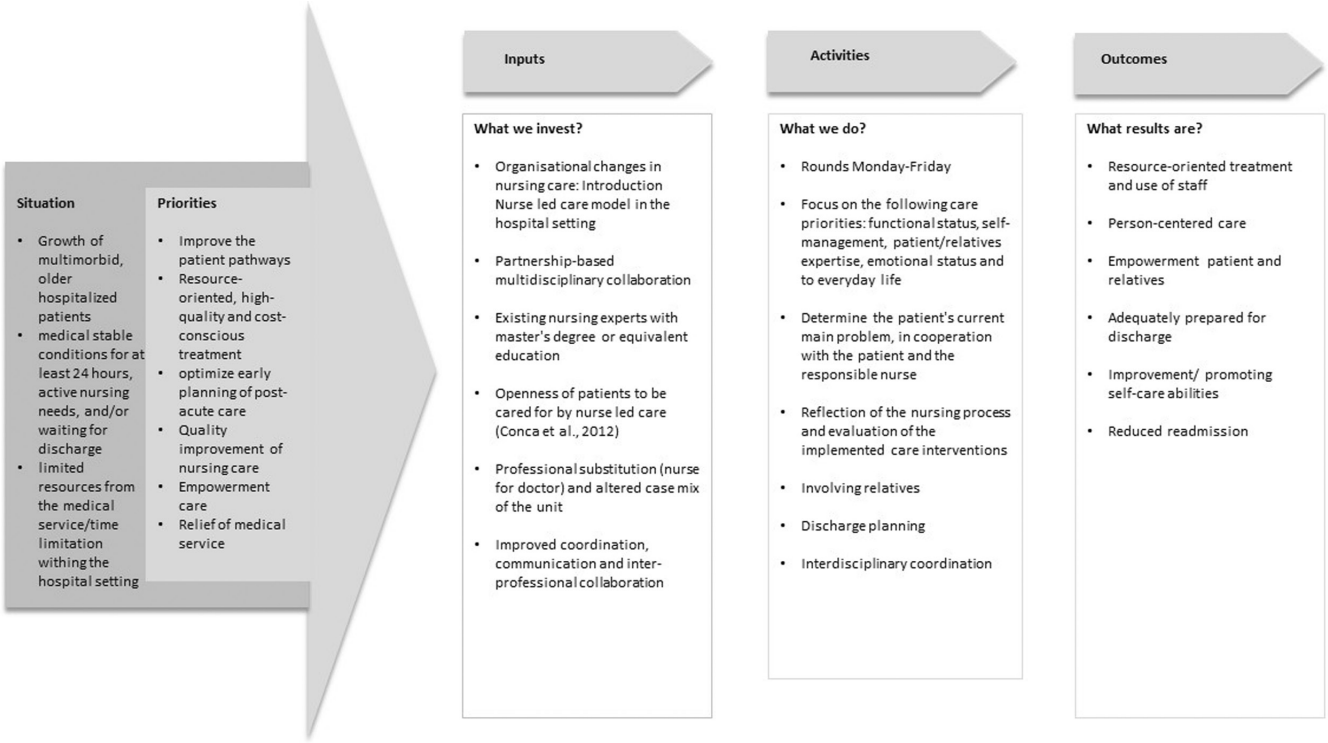

FIGURE 1 Logic model. Adapted from 'W.K. Kellogg Foundation Evaluation Handbook (2004)' (W.K.K. Foundation, 2004).

all-cause readmission within 18 days after hospital discharge were assessed. The 18-day follow-up time period was used referring to the regulations of the Swiss diagnosis-related group (DRG) flat rate system (SwissDRG, 2020). Table 1 presents a detailed description of the primary and secondary outcome variables used in this study.

2.4 | Data collection

We used data from electronic medical records to collect medical and sociodemographic variables. Data of the outcome variables were exported from an internal database of the medical controlling and the electronic clinical information system. Additional variables were extracted from the records by the staff from the department of nursing development and the TRIAGE study team which completed and controlled further data from patient charts like diagnosis, indication for NLC, post-acute care discharge deficits, medical stability, residence before and after discharge and length of hospital stay. Data were individually checked using the patient charts for non-plausible values suggesting entry errors and if necessary corrected.

2.5 | Statistical analysis

The analysis was conducted in two steps. Firstly, propensity score matching (PSM) (Austin, 2008; Thoemmes, 2012) was used to account for the covariates that may predict the NLC referral in order to compare patients with NLC and patients with usual care. Each NLC patient was assigned to one medical patient with usual care based on defined covariates. The following theory-based and literature-supported covariates were chosen for PSM analysis: age, days of medical stability until discharge, self-care ability at admission and higher probability of post-acute care discharge (see Table 1). As PSM estimation cannot be executed with missing data (Thoemmes, 2012), we excluded patients with missing data on any of the mentioned covariates. The estimation of the propensity score was made using logistic regression. Matching was completed using one-to-one nearest neighbour technique and allowed replacement. The maximum allowable difference between two patients (calliper) was defined by 0.3 [for a choice of calliper, see Austin (2011)]. The matching balance was judged based on recommended criteria (Thoemmes, 2012). Furthermore, demographic and health-related information such as gender, length of hospital stay and diagnosis were used as additional variables (see Table 1) to compare the control and intervention groups. The Wilcoxon signed-rank or the McNemar test and the Mann–Whitney-*U* test were used for all group comparisons.

In the second step, Generalized Estimation Equation (GEE) analyses for binary outcomes were applied to determine the likelihood and which variables were associated with NLC service. Based on clinical considerations and derived on findings of a pilot study (Wenke-Zobler et al., 2017), additional SPI subscales mobility, grooming and excretion were included for further analyses. In terms of the primary outcome variables a dichotomous categorization was used for the differences of the total SPI and the subscale scores between hospital admission and discharge containing 1 (any increase)

TABLE 1 Description of primary and secondary outcomes, propensity score matching covariates and additional variables.

Variables	Description	Instrument/reference	Administration details
Primary outcome			
Self-care ability (SPI)	The SPI assesses the extent of a person's self-care ability, across 10 items. The total score ranges from 10 (impaired self-care ability) to 40 (full self-care ability). The subscales are mobility, grooming and dressing (lower and upper body), nutrition (eating and drinking), excretion (urination and defecation), cognition/consciousness. The items are rated on a 4-point Likert scale. For example, the Likert scale of the subscale mobility include 1 = no ability to move, 2 = strongly impaired ability to move, 3 = slightly impaired ability to move, and 4 = full ability to move.	Self-care index (SPI), digitally recorded in outcome-oriented nursing assessment AcuteCare (ePA-AC©)	Filled in by nurses on admission, every third day and on discharge. Additional records are taken if patients' status changes and/or after a fall.
Secondary outcome			
Readmission	Readmission to the hospital within 18 days after hospital discharge	Medical controlling	Medical controlling records/18 days after discharge
PSM covariates			
Age	Age in years	Digital records	On admission
Self-care ability as assessed at admission	See SPI	See SPI	By nurses/on admission
Post-acute care discharge score	The post-acute care discharge (PACD) score is an instrument to estimate the risk of transfer to post-acute care facility following hospital discharge. The PACD contains the number of active medical problems, age, availability of support at home and limitations of activity of daily living/instrumental activities the last 2 weeks before hospital admission. The PACD was assessed on day 1 during hospitalization at a cut-off of ≥8 has shown 90% sensitivity and 62% specificity as well as a good predictive value (*AUC* = 0.81) regarding need of post-acute facility care (Louis Simonet et al., 2008).	PACD day 1	By nurses/on admission
Days of medical stability until discharge	Number of days from the time point of the determination (clinical judgement/estimation) of medically stable until hospital discharge	Digital records	By treating physician/on medical stability
Additional variables			
Gender	Male or female	Digital records	On admission
Length of hospital stay	Number of days stayed in the hospital	Digital records	at discharge
Diagnosis group	Classification of main diagnosis according to five groups of the International Statistical Classification of Diseases and Related Health Problems: neoplasms (tumour), disease of circulatory system, infectious/parasitic disease, disease of respiratory system and others	Digital records	On admission

Abbreviations: *AUC*, area under the curve; ePA-AC©, outcome-oriented nursing assessment AcuteCare; ICD-10-GM, International Classification of Diseases, 10th Version, German Modification; PACD, post-acute care discharge score; SPI, self-care index.

and 0 (no difference or decrease). The GEE models were analysed with the model control variables which included all significant variables of group comparisons after PSM. The STROBE checklist for observational research studies was used to guide this paper's development. Descriptive statistics included median (*Mdn*), mean (*M*), standard deviation (*SD*) and interquartile range (*IQR*) for continuous

variables, numbers and percentages for categorical variables were also used. All tests were considered statistically significant at $p < 0.05$. Data were analysed using IBM® SPSS® Statistics 23.

3 | RESULTS

For this study, 420 NLC and 2501 usual care patients were included. Of these, 114 NLC and 597 usual care patients were excluded because of missing data or in-hospital death. Thus, 306 NLC and 1904 usual care patients were used for PSM analysis. A detailed patient flow is presented in Figure 2. After execution of PSM, a total of 306 patients per group were included in the final analysis.

Table 2 shows background data prior to PSM. Comparisons of covariates indicated that NLC patients were significantly older, were longer medically stable until discharge, had a higher risk of discharge to a post-acute care institution, and a lower self-care ability compared to usual care patients. After the execution of PSM, only a significant difference remained for age (Table 2). Older patients were still more frequent in the NLC compared with the control group. A remaining significant difference between the two groups in terms of main diagnosis was also observed (Table 3). NLC patients were more frequently diagnosed with a neoplasm compared with usual care patients. The balance improvements of the covariates for the matched group are illustrated in Figure 3. Mean propensity scores and standard deviations were similar for the intervention ($M = 0.65$, $SD = 0.32$) and the control group ($M = 0.64$, $SD = 0.33$).

For a more comprehensive picture of the two groups after PSM, we additionally analysed patients' residence before and after hospitalization. Findings indicated that patients of both groups were most frequently admitted to the hospital from home (Table S1). However, the most common discharge place in the NLC group was a rehabilitation clinic, while patients of the control group were most frequently discharged home. Furthermore, the most frequent indicative reason for NLC services was the need for activating care until a place was available in a rehabilitation institution or nursing home (Table S2). By contrast, activating care until discharged home or end-of-life care was the least likely reason.

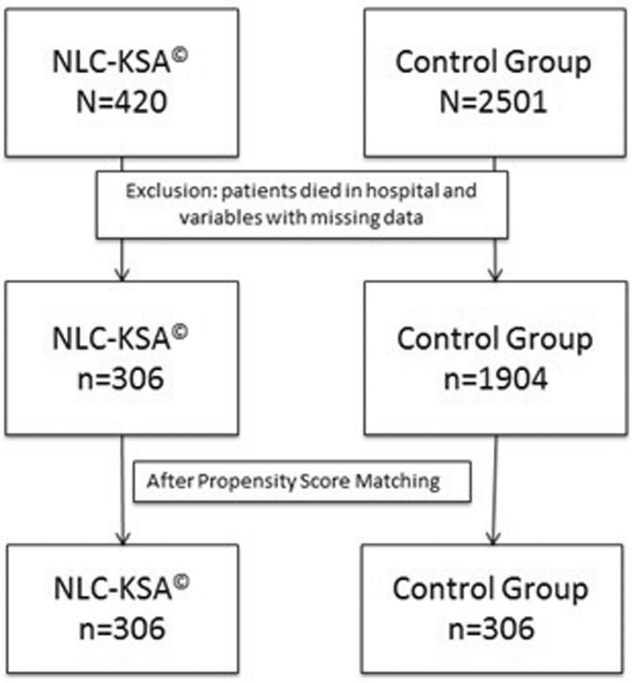

FIGURE 2 Flowchart of patient recruitment. NLC, nurse-led care.

The main findings of GEE analyses showed that, compared with the control group, NLC patients showed significant improvement regarding their self-care ability from the time of admission to the time of discharge, after adjusting for age and diagnosis ($B = 1.09$; 95% CI, 0.75–1.45; $p < 0.001$; Table 4). Additionally, this improvement of total SPI score was substantially higher in the NLC group than in the control group. This was the case for 204 NLC patients (66.7%) compared with 133 control patients (43.5%). Furthermore, the results demonstrated an increase in a total SPI score in the NLC group from a median of 31 ($IQR = 10.0$) to a median of 35 ($IQR = 11.0$). On the contrary, the total SPI score of patients in the control group remained the same ($Mdn = 32$; $IQR = 12.3$ to $Mdn = 32$; $IQR = 13.0$).

According to SPI subscales, the GEE findings showed that there were significantly better changes in mobility from hospital admission to discharge among the NLC patients compared to control patients. Such an improvement during hospitalization could be seen in 139 NLC patients (45.4%) and 97 control patients (31.7%). Furthermore, similar results were found for the other two subscales grooming and excretion. For grooming, improvements were higher in the NLC group (170 patients; 55.6%) than the control group (97 patients; 31.7%). Regarding excretion, a higher improvement was also shown in the NLC group compared with the control group (113 patients; 36.9% vs. 65 patients; 21.2%).

According to the secondary outcome, nine NLC patients (2.9%) and 49 patients of the control group (16.0%) were re-hospitalized within 18 days following discharge. After controlling for age, the GEE analysis showed that NLC patients were significantly less readmitted to hospital compared with control patients ($B = -1.763$; $p < 0.001$).

4 | DISCUSSION

In this study, we demonstrated an overall improvement of self-care ability in patients receiving NLC compared to usual care patients as assessed in a real-world setting. We furthermore demonstrated that NLC impacts readmission. Both findings correspond with the findings of a previous pilot study (Wenke-Zobler et al., 2017). More specifically, patients who had a NLC service during hospitalization showed increased recovery in terms of their ability to move. Our data further indicated that in this real-world cohort of consecutively included patients, NLC results in substantial improvements in terms of grooming and excretion. Moreover, findings of the logistic generalized estimating equation analysis provide support for the beneficial effect of a NLC intervention regardless of patients' age and diagnosis.

TABLE 2 Descriptive statistics and comparisons of covariates between nurse-led care and usual care patients before and after propensity score matching.

Covariates	Unmatched patients			PSM-matched patients		
	NLC ($n = 306$)	Usual care ($n = 1904$)	*p*-value	NLC ($n = 306$)	Usual care ($n = 306$)	*p*-value
Age in years, median (*IQR*)	80 (15.0)	70 (21.0)	<0.001[a]	80 (15.0)	76 (20.0)	0.027[b]
<65, *n* (%)	47 (15.4)	696 (36.6)		47 (15.4)	82 (26.8)	
65–84, *n* (%)	178 (58.2)	991 (52.0)		178 (58.2)	150 (49.0)	
>84, *n* (%)	81 (26.5)	217 (11.4)		81 (26.5)	74 (24.2)	
Post-acute care discharge score, median (*IQR*)[c]	11 (7.0)	6 (7.0)	<0.001[a]	11 (7.0)	10 (11.0)	0.391[b]
Self-care ability at admission, median (*IQR*)	31 (10.0)	37 (8.0)	<0.001[a]	31 (10.0)	32 (12.3)	0.543[b]
Days of medical stability until discharge, median (*IQR*)	7 (5.0)	0 (0.0)	<0.001[a]	7 (5.0)	7 (7.0)	0.080[b]

Abbreviations: *IQR*, interquartile range; NLC, nurse-led care; PSM, propensity score matching.

[a]Mann–Whitney *U*-test.

[b]Wilcoxon signed-rank test.

[c]Total score ≥8 indicates an increased risk of discharge to a post-acute care facility (Conca et al., 2012).

TABLE 3 Comparisons in terms of additional variables between nurse-led care and usual care patients after propensity score matching.

	NLC patients ($n = 306$)	Control group ($n = 306$)	*p*-value
Gender, *n* (%)			0.872[b]
Female	164 (53.6)	167 (54.6)	
Male	142 (46.4)	139 (45.4)	
Length of stay in days, median (*IQR*)	15 (10.0)	11 (9.0)	0.093[a]
0–10, *n* (%)	58 (19.0)	93 (30.4)	
>10, *n* (%)	248 (81.0)	213 (69.6)	
Main diagnosis, *n* (%)			<0.001[b]
Neoplasms (tumour)	48 (15.7)	16 (5.2)	
Disease of circulatory system	62 (20.3)	90 (29.4)	
Infectious/parasitic disease	16 (5.2)	40 (13.1)	
Disease of respiratory system	36 (11.8)	29 (9.5)	
Others	144 (47.1)	131 (42.8)	

Abbreviation: *IQR*, interquartile range.

[a]Wilcoxon signed-rank test.

[b]McNemar test.

These findings of improved self-care abilities in NLC patients confirm the effect of an NLC intervention based on a comprehensive assessment on self-management, functional status, patients' and relatives' expertise, emotional status and closeness to everyday life. Based on such comprehensive assessment, patients are asked of their main problem for who they should receive nursing support for the time till discharge. This promotes an activating care within the recovery process. Covinsky et al. (2011) highlighted the importance of the use of comprehensive and early assessments to prepare the patient adequately before discharge and avoid rushed planning (Covinsky et al., 2011).

An important skill we used for self-management was solution-finding. Solution-finding includes problem definition, generating possible solutions, solution implementation and evaluation of results (Lorig & Holman, 2003). Such skills can help to cope with self-care difficulties and other hospital discharge-associated problems and challenges. Another self-management skill we promoted was to find and utilize patient resources. For example, involving relatives could lead to more security, confidence and sustainability. In the literature, a wide number of intervention studies exist, which focus on improved self-management ability of individuals (Lorig & Holman, 2003). Unfortunately, interventions are not clearly described in most of these studies. In addition, there are several additional concepts such as empowerment, which makes it difficult to obtain a sufficient overview of the effectiveness and subsequent adequate comparison. However, theory-based statements confirm the positive effect of self-management interventions on self-care abilities, especially in chronically ill patients (Lorig & Holman, 2003).

As expected, the NLC-group showed significant improvements of mobility. These findings are consistent with previous studies (Harris et al., 2007; Van et al., 2010). In our study the NLC service instructed simple exercises to improve strength, flexibility and balance (Tideiksaar, 2008b). The patient was motivated to perform the exercises as often as possible during the day, starting already during hospitalization. Whenever possible, family members were also involved to support the patient in increasing mobility. It

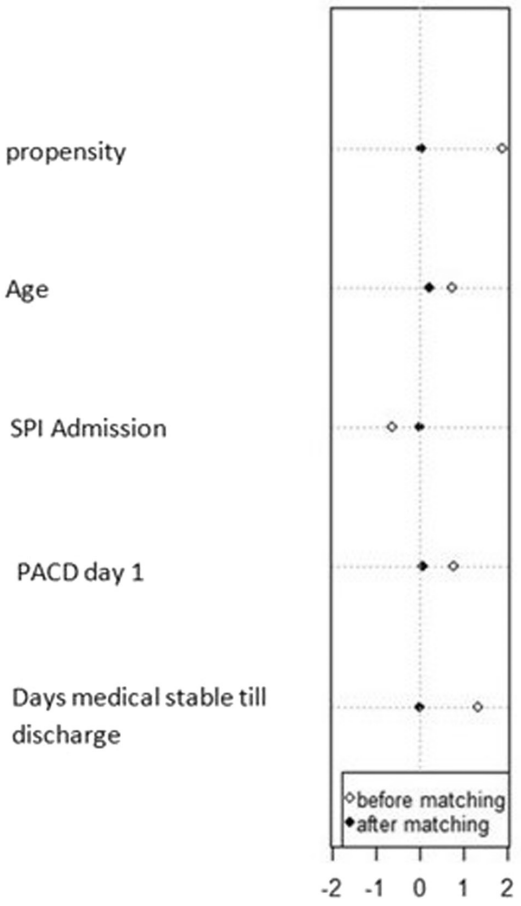

FIGURE 3 Mean standardized differences for covariates before and after matching. NLC, nurse-led care; PACD, post-acute care discharge score; SPI, self-care index.

is recommended that such exercises should be performed at least three times a day (Tideiksaar, 2008a). This result can be an indication of the effectiveness and right dose of the exercises used. Beyond this, during the NLC ward rounds, progress was discussed with patients, nurses and physiotherapists. It can be assumed that through the continuous and multi-professional treatment, the motivation of the patient to perform the exercises regularly could be maintained. Several studies confirmed the positive effect of an interdisciplinary approach to promote mobility in hospitalized patients (Czaplijski et al., 2014; Dammeyer et al., 2013). It seems important to create a culture of mobility within the team leading to the mobilization of patients as often as possible. Furthermore, the difference to usual care was small but of clinical significance. For example, a change from one point on the mobility score could mean a change from 'strongly impaired ability to move' to 'slightly impaired ability to move' which means that a patient can cover a short distance alone, that is more independently of nursing staff. This could also have a significant impact on the patient's well-being.

Besides mobility, patients in the NLC intervention group also improved their ability of grooming and excretion during hospitalization. To the author's current knowledge, no study investigated this outcome in relation to NLC service. Friedli et al. (2019) compared self-care abilities of older patients in acute geriatric units and internal medicine. They showed a significantly higher odd to gain independence for acute geriatric units in grooming lower body, defecation and mobility. The acute geriatric unit focuses on early rehabilitative treatment of multimorbid acutely ill patients with older age in acute hospitals and offering additional therapy in a multidisciplinary team setting. The main aim is to improve the functional status (Friedli et al., 2019). Otherwise, previous studies showed that an early mobilization has a positive effect on general recovery and other patient-related conditions such as pain relief, fatigue, urinary tract infection and physical function such as emotional and social well-being (Dammeyer et al., 2013; Kalisch et al., 2014). Therefore, we assume that due to the complexity of the intervention that was carried out, the effect is not related to one single component such as mobility, rather is the result from different interactive components. However, we suggest that mobility could be a strong predictor, meaning a general change in mobility is related with changes in other areas of daily life such as grooming and excretion. While our study was not designed to elucidate the contribution of each factor, further exploration is clearly warranted.

Regarding the secondary outcome, the readmission rate in the intervention group was lower than the control group. Furthermore, our study confirmed that this beneficial effect of NLC service on rehospitalization exists independently of diagnosis. This result is consistent with findings of a review that showed a lower readmission rate in inpatients admitted to a NLC unit (Griffiths, Edwards, et al., 2007). The reduced readmission rate found in our study could be explained by a comprehensive discharge plan due to the NLC service and its empowerment of patients and relatives. Furthermore, an additional study showed that the perception of readiness for discharge and the length of stay are important predictors of readmission rates (Kaya et al., 2018). In our NLC group, hospitalization was significantly longer than the control group. We further suggest that the observed effect of a reduced readmission rate could also be explained by an effective discharge planning and follow-up care. Findings of a review confirms such effects of an effective discharge planning on reduced readmission rates (Goncalves-Bradley et al., 2016).

Another explanation of a reduced readmission rate in our NLC patients could possibly relate to the fact that most of our patients in the NLC group were discharged to a rehabilitation clinic, which was the most frequent indicating reason for NLC (see Table S2). In Switzerland, rehabilitation stays after hospital discharge lasts 14–21 days. During this time, patients can improve physical mobility, subsequently better preparing themselves for a home discharge. There is some evidence that severely ill and multimorbid patients need more time for recovery, thereby the combination of illnesses can have a significant impact (Juul-Larsen et al., 2020). Furthermore, our result of a decreased readmission rate in the NLC group could also be explained by a mediational effect, in which NLC intervention leads to less readmission through rehabilitation. It is known that intensified rehabilitation and early mobilization helps patients improve their functional abilities and successfully transition from the hospital to the home setting (Pashikanti & Von Ah, 2012). A retrospective

TABLE 4 Summary of generalized estimating equation analyses of primary outcome variables controlled for age and diagnosis.

	SPI total score		Mobility		Grooming		Excretion	
	B	*95% CI*	*B*	*95% CI*	*B*	*95% CI*	*B*	*95% CI*
NLC versus control group								
NLC patients	1.09[c]	0.72, 1.45	0.78[c]	0.43, 1.12	1.14[c]	0.78, 1.51	0.99[c]	0.58, 1.39
Usual care patients (reference)								
Age	−0.01[a]	−0.03, 0.00	−0.01	−0.02, 0.00	−0.02[b]	−0.04, −0.01	0.00	−0.01, 0.01
Diagnosis								
Disease of respiratory system	0.73[a]	0.15, 1.32	0.46	−0.10, 1.01	0.93[b]	0.35, 1.51	0.47	−0.12, 1.06
Disease of circulatory system	−0.18	−0.59, 0.22	0.21	−0.22, 0.64	−0.09	−0.53, 0.35	−0.40	−0.91, 0.11
Neoplasms (tumour)	−0.50	−1.13, 0.12	−0.86[a]	−1.51, −0.21	−0.39	−0.98, 0.20	−0.46	−1.14, 0.22
Infectious/ parasitic disease	0.54	−0.06, 1.14	0.73[a]	0.12, 1.34	0.39	−0.20, 1.67	1.54[c]	0.90, 2.17
Others (reference)								

Note: A dichotomous categorization was used for all outcome variables; 1 = any increase between admission and discharge, 0 = no difference or a decrease between admission and discharge.

Abbreviations: *B*, regression coefficient; *CI*, confidence interval.

[a]$p < 0.05$.

[b]$p < 0.01$.

[c]$p < 0.001$.

study reviewing inpatients confirmed that rehabilitation cases across 16 impairment groups found functional status as a greater predictor of hospital readmission than comorbidities (Shih et al., 2016).

In a preliminary study, we already showed that medical patients were compliant to participate in NLC intervention (Conca et al., 2012). High acceptability could also be found in the current study. The majority of the patients for whom NLC was proposed were willing to transfer their care to NLC. Acceptability of interventions is a necessary condition for an intervention to be effective. Further, patients are more likely to adhere to treatment recommendations and to benefit from improved clinical outcomes (Sekhon et al., 2017). On the other hand, our experiences showed that at the beginning interdisciplinary acceptance was low due to lack of information about the intervention with a regular rotation of physicians. At a later point and with more positive experience the intervention was increasingly accepted and used.

4.1 | Limitation

The use of propensity score matching method meant we were able to use a big data pool to balance treatment groups with respect to measured covariates, reducing bias due to confounding (Staffa & Zurakowski, 2018). Moreover, NLC could be feasibly implemented in routine care (Schäfer-Keller, 2012; Schäfer-Keller et al., 2013). Nonetheless, this study has several limitations. Although we used PSM which permits a more objective analysis, it only allows for adjustment of measured confounders. However, this limitation can be applied for a broad dataset and multivariable adjustment methods. The use of PSM matching depends on a complete data set. Thus, we cannot rule out completely that study results were biased because of excluded patients due to missing data. Furthermore, our study assessment used different time intervals. To ensure a sufficient data pool, the collection time period of the intervention group was longer compared to the control group. Thus, data may be biased by context factors such as restructure of institutional resources. Finally, the used GEE models are limited to a few control variables. Some variability in the outcome may be accounted for by other variables. This was especially the case for the secondary outcome and due to lacking cell values, the control variable diagnosis had to be excluded.

5 | CONCLUSION

Our real-world analysis from a large Swiss tertiary centre confirmed that NLC is a promising concept in the care of medically stable inpatients. Furthermore, our findings showed that, in a real-world hospital setting, NLC service is effective and feasible. We demonstrated

that if nurses are empowered to increase engagement in the domains of functional status, self-management, patient/relative expertise, emotional status and everyday life this will positively affect patient recovery. In particular, improved self-care ability is an important resource for a successful discharge process contributing to an increased quality of life. We think that the effects on self-care ability and mobility were due to the combination of intervention including comprehensive assessment, empowerment, individual care planning, early discharge planning, facilitation of rehabilitation through the instruction of exercises and the multi-professional approach. It can be concluded that a multimodal approach is needed to administer successful support of multimorbid and frail patients in the hospital setting. However, the relationship between the individual interventions remains unclear and should be investigated in future research. In addition, the dose and weighting of the individual interventions should be investigated further. So that those interventions can be made more efficient. To improve the practical work, the multimodal approach in the treatment of multimorbid inpatients should be taught individually to nurses, therapists, social workers and physicians. Based on DRG regulations, only a short follow-up time period was used in this study to investigate secondary outcome such as the readmission rate. Thus, longitudinal studies should be considered in future research.

6 | RELEVANCE TO CLINICAL PRACTICE

Our study finding highlights the worth of an NLC intervention to try new roles in practice and make use of a patient-centred approach. Moreover, NLC has positive outcomes because patients' needs are systematically assessed, relatives are involved and are continuously accompanied by specialized nurses. Insights of this study further provide the feasibility of such interventions in an acute care setting. Finally, additional development of the roles of nurses could make the field of nursing more attractive and promote independence and empowerment in the future.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

Data is available on request.

ETHICS STATEMENT

The current work embedded within the TRIAGE project was approved by the Institutional Review Boards (IRB) of the Canton of Aargau and waived the need for individual informed consent (EK 2012/059). In the present study, physicians obtained patients' consent for NLC service.

ORCID

Lukas Faessler https://orcid.org/0000-0002-9344-7500
Antoinette Conca https://orcid.org/0000-0002-5271-7199

REFERENCES

Aubert, C. E., Schnipper, J. L., Fankhauser, N., Marques-Vidal, P., Stirnemann, J., Auerbach, A. D., Zimlichman, E., Kripalani, S., Vasilevskis, E. E., Robinson, E., Metlay, J., Fletcher, G. S., Limacher, A., & Donzé, J. (2020). Association of patterns of multimorbidity with length of stay: A multinational observational study. *Medicine (Baltimore)*, *99*(34), e21650. https://doi.org/10.1097/md.0000000000021650

Austin, P. C. (2008). A critical appraisal of propensity-score matching in the medical literature between 1996 and 2003. *Statistics in Medicine*, *27*(12), 2037–2049. https://doi.org/10.1002/sim.3150

Austin, P. C. (2011). Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharmaceutical Statistics*, *10*(2), 150–161. https://doi.org/10.1002/pst.433

Brunner, C., Conca, A., Reutlinger, B., Schütz, P., & Schäfer-Keller, P. (2015). Patienten und pflegende Angehörige im Fokus von nurse-led care. *Betroffenenexpertise Und Alltagsnähe. Krankenpflege*, *1*, 14–17.

Chua, Y. P., Xie, Y., Lee, P. S. S., & Lee, E. S. (2021). Definitions and prevalence of multimorbidity in large database studies: A scoping review. *International Journal of Environmental Research and Public Health*, *18*(4), 1673. https://doi.org/10.3390/ijerph18041673

Conca, A., Bossart, R., Regez, K., Wallimann, G., Schweingruber, R., Hantikainen, V., Tobias, P., Albrich, W., Rüegger, K., Dusemund, F., Bürgi, U., Sigrist, T., Mariacher-Gehler, S., Huber, A., Schütz, P., Müller, B., Reutlinger, B., & Reutlinger, B. (2012). OPTIMA – Optimierter patienten-transfer durch innovatives multidisziplinäres assessment. *Pflegewissenschaft*, *05*, 291–298.

Covinsky, K. E., Pierluissi, E., & Johnston, C. B. (2011). Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure". *JAMA*, *306*(16), 1782–1793. https://doi.org/10.1001/jama.2011.1556

Czaplijski, T., Marshburn, D., Hobbs, T., Bankard, S., & Bennett, W. (2014). Creating a culture of mobility: An interdisciplinary approach for hospitalized patients. *Hospital Topics*, *92*(3), 74–79. https://doi.org/10.1080/00185868.2014.937971

Dammeyer, J. A., Baldwin, N., Packard, D., Harrington, S., Christofferson, B., Christopher, J., Strachan, C. L., & Iwashyna, J. (2013). Mobilizing outcomes: Implementation of a nurse-led multidisciplinary mobility program. *Critical Care Nursing Quarterly*, *36*(1), 109–119. https://doi.org/10.1097/CNQ.0b013e31827535db

Doessing, A., & Burau, V. (2015). Care coordination of multimorbidity: A scoping study. *Journal of Comorbidity*, *5*, 15–28. https://doi.org/10.15256/joc.2015.5.39

W.K.K. Foundation. (2004). *Logic model development guide*. W.K.K. Foundation.

Friedli, M., Schuetz, P., & Conca, A. (2019). Comparison of older patient's self-care abilities in acute geriatric and internal medicine departments. *Zeitschrift für Gerontologie Und Geriatrie*, *53*, 409–415. https://doi.org/10.1007/s00391-019-01570-y

Goncalves-Bradley, D. C., Lannin, N. A., Clemson, L. M., Cameron, I. D., & Shepperd, S. (2016). Discharge planning from hospital. *Cochrane Database of Systematic Reviews*, *1*, CD000313. https://doi.org/10.1002/14651858.CD000313.pub5

Griffiths, C., Foster, G., Ramsay, J., Eldridge, S., & Taylor, S. (2007). How effective are expert patient (lay led) education programmes for chronic disease? *BMJ*, *334*(7606), 1254–1256.

Griffiths, P., Edwards, M. E., Forbes, A., Harris, R. G., & Ritchie, G. (2007). Effectiveness of intermediate care in nursing-led in-patient units. *Cochrane Database Systematic Reviews*, *2*, CD002214. https://doi.org/10.1002/14651858.CD002214.pub3

Grosse Schlarmann, J. (2007). *Der CMS© im ePA©. Verschiedene Qualitätsdimensionen eines Instruments. Eine empirische Analyse*. (Master Empirische Analyse), Private Universität Witten/Herdecke gGmbH. Retrieved from http://www.epa-cc.de/files/content/Downloads/Schlarmann_MASTERARBEIT_public.pdf

Harris, R., Wilson-Barnett, J., & Griffiths, P. (2007). Effectiveness of nursing-led inpatient care for patients with post-acute health care needs: Secondary data analysis from a programme of randomized controlled trials. *Journal of Evaluation in Clinical Practice*, *13*(2), 198–205. https://doi.org/10.1111/j.1365-2753.2006.00672.x

Jeffs, L., Kuluski, K., Law, M., Saragosa, M., Espin, S., Ferris, E., Merkley J, Dusek B, Kastner M Bell, C. M. (2017). Identifying effective nurse-led care transition interventions for older adults with complex needs using a structured expert panel. *Worldviews on Evidence-Based Nursing*, *14*(2), 136–144. doi:https://doi.org/10.1111/wvn.12196

Juul-Larsen, H. G., Andersen, O., Bandholm, T., Bodilsen, A. C., Kallemose, T., Jorgensen, L. M., Klausen, H. H., Gilkes, H., & Petersen, J. (2020). Differences in function and recovery profiles between patterns of multimorbidity among older medical patients the first year after an acute admission-an exploratory latent class analysis. *Archives of Gerontology and Geriatrics*, *86*, 103956. https://doi.org/10.1016/j.archger.2019.103956

Kalisch, B. J., Lee, S., & Dabney, B. W. (2014). Outcomes of inpatient mobilization: A literature review. *Journal of Clinical Nursing*, *23*(11–12), 1486–1501. https://doi.org/10.1111/jocn.12315

Katkade, V. B., Sanders, K. N., & Zou, K. H. (2018). Real world data: An opportunity to supplement existing evidence for the use of long-established medicines in health care decision making. *Journal of Multidisciplinary Healthcare*, *11*, 295–304. https://doi.org/10.2147/jmdh.s160029

Kaya, S., Sain Guven, G., Aydan, S., Kar, A., Teles, M., Yildiz, A., Koca, G. Ş., Kartal, N., Korku, C., Ürek, D., Demir, İ. B., & Toka, O. (2018). Patients' readiness for discharge: Predictors and effects on unplanned readmissions, emergency department visits and death. *Journal of Nursing Management*, *26*(6), 707–716. https://doi.org/10.1111/jonm.12605

Lorig, K. R., & Holman, H. (2003). Self-management education: History, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine*, *26*(1), 1–7. https://doi.org/10.1207/S15324796ABM2601_01

Louis Simonet, M., Kossovsky, M. P., Chopard, P., Sigaud, P., Perneger, T. V., & Gaspoz, J. M. (2008). A predictive score to identify hospitalized patients' risk of discharge to a post-acute care facility. *BMC health services research*, *8*, 154. https://doi.org/10.1186/1472-6963-8-154

Miani, C., Ball, S., Pitchforth, E., Exley, J., King, S., Roland, M., Fuld, J., & Nolte, E. (2014). *Organisational interventions to reduce length of stay in hospital: A rapid evidence assessment*. Queen's Printer and Controller of HMSO.

Navickas, R., Petric, V. K., Feigl, A. B., & Seychell, M. (2016). Multimorbidity: What do we know? What should we do? *Journal of Comorbidity*, *6*(1), 4–11. https://doi.org/10.15256/joc.2016.6.72

Parent, V., Ludwig-Béal, S., Sordet-Guépet, H., Popitéan, L., Camus, A., Da Silva, S., Lubrano, A., Laissus, F., Vaillard, L., & Manckoundia, P. (2016). Prolonged stays in hospital acute geriatric care units: Identification and analysis of causes. *Geriatrie et Psychologie Neuropsychiatrie du Vieillissement*, *14*(2), 135–141. https://doi.org/10.1684/pnv.2016.0602

Pashikanti, L., & Von Ah, D. (2012). Impact of early mobilization protocol on the medical-surgical inpatient population: An integrated review of literature. *Clinical Nurse Specialist*, *26*(2), 87–94. https://doi.org/10.1097/NUR.0b013e31824590e6

Schäfer-Keller, P. (2012). *Entwicklung, Einführung und Evaluation einer pflegegeleiteten Einheit (Nurse-led Unit) im Akutspital für PatientInnen in medizinisch stabilen Zustand: Erste Ergebnisse der Machbarkeitsprüfung*. Paper presented at the Fachlunch, USZ, Zürich.

Schäfer-Keller, P., Reutlinger, B., & Müller, B. (2013). *Nurse-led care am KSA© (NLC-KSA©)*. Paper presented at the table politique–Helsana Kaderanlass, Zürich-Oerlikon.

Schneider, F., Kaplan, V., Rodak, R., Battegay, E., & Holzer, B. (2012). Prevalence of multimorbidity in medical inpatients. *Swiss Medical Weekly*, *142*, w13533. https://doi.org/10.4414/smw.2012.13533

Schuetz, P., Hausfater, P., Amin, D., Amin, A., Haubitz, S., Faessler, L., Kutz, A., Conca, A., Reutlinger, B., Canavaggio, P., Sauvin, G., Bernard, M., Huber, A., & Mueller, B. (2015). Biomarkers from distinct biological pathways improve early risk stratification in medical emergency patients: The multinational, prospective, observational TRIAGE study. *Critical Care*, *19*, 377. https://doi.org/10.1186/s13054-015-1098-z

Sekhon, M., Cartwright, M., & Francis, J. J. (2017). Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework. *BMC Health Services Research*, *17*(1), 88. https://doi.org/10.1186/s12913-017-2031-8

Shih, S. L., Zafonte, R., Bates, D. W., Gerrard, P., Goldstein, R., Mix, J., Niewczyk, P., Greysen, S. R., Kazis, L., Ryan, C. M., & Schneider, J. C. (2016). Functional status outperforms comorbidities as a predictor of 30-day acute care readmissions in the inpatient rehabilitation population. *Journal of the American Medical Directors Association*, *17*(10), 921–926. https://doi.org/10.1016/j.jamda.2016.06.003

Staffa, S. J., & Zurakowski, D. (2018). Five steps to successfully implement and evaluate propensity score matching in clinical research studies. *Anesthesia and Analgesia*, *127*(4), 1066–1073. https://doi.org/10.1213/ANE.0000000000002787

Suvarna, V. R. (2018). Real world evidence (RWE) – Are we (RWE) ready? *Perspectives in Clinical Research*, *9*(2), 61–63. https://doi.org/10.4103/picr.PICR_36_18

Swiss Health Observatory (2020) Retrieved from https://ind.obsan.admin.ch/indicator/obsan/dauer-der-stationaeren-aufenthalte-in-akutsomatik-psychiatrie-und-rehabilitation

SwissDRG. (2020). *Regeln und definitionen zur fallabrechnung unter SwissDRG und TARPSY*.

Thoemmes, F. (2012). Propensity score matching in SPSS. Retrieved December 6, 2015, from University of Tübingen. http://arxiv.org/ftp/arxiv/papers/1201/1201.6385.pdf

Tideiksaar, R. (2008a). *Stürze und sturzprävention* (H. Michael, Trans. Vol. 2., vollständige überarbeitete). Hogrefe, vorm. Hans Huber.

Tideiksaar, R. (2008b). *Sturzursachen und sturzrisiko stürze und sturzprävention: Assessment prävention management* (pp. 52–53). Verlag Hans Huber.

Uijen, A. A., & van de Lisdonk, E. H. (2008). Multimorbidity in primary care: Prevalence and trend over the last 20 years. *The European Journal of General Practice*, *14*(Suppl 1), 28–32. https://doi.org/10.1080/13814780802436093

Van Craen, K., Braes, T., Wellens, N., Denhaerynck, K., Flamaing, J., Moons, P., Boonen, S., Gosset, C., Petermans, J., & Milisen, K. (2010). The effectiveness of inpatient geriatric evaluation and management units: A systematic review and meta-analysis. *Journal of the American Geriatrics Society*, *58*(1), 83–92. https://doi.org/10.1111/j.1532-5415.2009.02621.x

van Oostrom, S. H., Gijsen, R., Stirbu, I., Korevaar, J. C., Schellevis, F. G., Picavet, H. S., & Hoeymans, N. (2016). Time trends in prevalence of chronic diseases and multimorbidity not only due to aging: Data from general practices and health surveys. *PLoS One*, *11*(8), e0160264. https://doi.org/10.1371/journal.pone.0160264

van Vliet, M., Huisman, M., & Deeg, D. J. H. (2017). Decreasing hospital length of stay: Effects on daily functioning in older adults. *Journal of the American Geriatrics Society*, *65*(6), 1214–1221. https://doi.org/10.1111/jgs.14767

Wenke-Zobler, J., Brunner, C., Schäfer-Keller, P., Reutlinger, B., De Geest, S., Schubert, M., Regez, K., Schuetz, P., & Conca, A. (2017). Verbessert eine pflegegeleitete Versorgung die Selbstpflegefähigkeiten? Eine quasi-experimentelle Studie. *Klinische Pflegeforschung*, *3*, 48–60.

WHO. (2015). *World health report on ageing and health*. World Health Organization.

Wong, F. K., & Chung, L. C. (2006). Establishing a definition for a nurse-led clinic: Structure, process, and outcome. *Journal of Advanced Nursing*, *53*(3), 358–369. https://doi.org/10.1111/j.1365-2648.2006.03730.x

Zhu, Q. M., Liu, J., Hu, H. Y., & Wang, S. (2015). Effectiveness of nurse-led early discharge planning programmes for hospital inpatients with chronic disease or rehabilitation needs: A systematic review and meta-analysis. *Journal of Clinical Nursing*, *24*(19–20), 2993–3005. https://doi.org/10.1111/jocn.12895

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