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Review Article

Feasibility of Perioperative eHealth Interventions for Older Surgical Patients: A Systematic Review

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A B S T R A C T

Objectives: EHealth interventions are increasingly being applied in perioperative care but have not been adequately studied for older surgical patients who could potentially benefit from them. Therefore, we evaluated the feasibility of perioperative eHealth interventions for this population.
Design: A systematic review of prospective observational and interventional studies was conducted. Three electronic databases (PubMed, EMBASE, CINAHL) were searched between January 1999 and July 2019. Study quality was assessed by Methodological Index for Non-Randomized Studies (MINORS) with and without control group.
Setting and Participants: Studies of surgical patients with an average age ≥65 years undergoing any perioperative eHealth intervention with active patient participation (with the exception of telerehabilitation following orthopedic surgery) were included.
Measures: The main outcome measure was feasibility, defined as a patient's perceptions of usability, satisfaction, and/or acceptability of the intervention. Other outcomes included compliance and study completion rate.
Results: Screening of 1569 titles and abstracts yielded 7 single-center prospective studies with 223 patients (range n = 9–69 per study, average age 66–74 years) undergoing oncological, cardiovascular, or orthopedic surgery. The median MINORS scores were 13.5 of 16 for 6 studies without control group, and 14 of 24 for 1 study with a control group. Telemonitoring interventions were rated as "easy to use" by 89% to 95% of participants in 3 studies. Patients in 3 studies were satisfied with the eHealth intervention and would recommend it to others. Acceptability (derived from consent rate) ranged from 71% to 89%, compliance from 53% to 86%, and completion of study follow-up from 54% to 95%.
Conclusions and Implications: Results of 7 studies involving perioperative eHealth interventions suggest their feasibility and encourage further development of technologies for older surgical patients. Future feasibility studies require clear definitions of appropriate feasibility outcome measures and a comprehensive description of patient characteristics such as functional performance, level of education, and socioeconomic status.

EHealth, defined by the World Health Organization as the use of information and communication technologies for health,[1] has been rapidly developing in recent decades.[2] Digital technologies are applied in perioperative care to promote patient engagement and to monitor and manage a patient's health status, as an addition to or a replacement for care-as-usual.[3–6] Although eHealth technologies have mostly been applied within younger populations,[5] they could be of value in supporting patient independence, psychological well-being, and health status of older populations as well.[7,8]

The effectiveness of technological devices with the aim of self-management and telemonitoring has mainly been studied in older patients with chronic cardiac diseases or diabetes, rather than in older surgical populations.[9,10] An exception to this is telerehabilitation following elective orthopedic surgery, which has been demonstrated to be noninferior to face-to-face physiotherapy in older patients.[11–14] Older patients who undergo more complex surgery are at an increased risk for developing postoperative complications due to comorbidity, and because of early hospital discharge after surgery, these complications more frequently occur at home.[15,16] Therefore, this

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population could potentially benefit from eHealth interventions for purposes such as early detection of complications; however, examples in the literature are scarce. A possible explanation for the paucity of studies on eHealth in older patients undergoing complex surgery is that implementation of digital health solutions is considered unfeasible for this population because of concerns pertaining to usability, compliance, and availability of technology.[17]

Therefore, the goal of this systematic review was to evaluate the feasibility of perioperative eHealth interventions in surgical patients with an average age of 65 years and older.

Methods

This systematic review was performed according to the PRISMA guidelines.[18] A protocol was registered on PROSPERO (Registration number: CRD42019145298). The search strategy was constructed by a research physician (LTJ) together with an academic librarian. A comprehensive literature search was performed in 3 electronic databases, PubMed, EMBASE, and CINAHL, for papers published between January 1999 and July 2019. The search strategy was constructed based on the PICOS (patient, intervention, comparator, outcome, and study design) model, and consisted of combined variations on and synonyms for the following terms: P = "older patients", I = "eHealth", "perioperative period", and S = "no review" (Supplementary Tables 1–3). We did not include terms for comparator (C) or outcome (O) in our search string because we aimed to find as many relevant citations as possible. The citations were assessed for eligibility based on the inclusion and exclusion criteria listed in Table 1. Studies describing telerehabilitation following orthopedic surgery were excluded because the feasibility and effectiveness of telerehabilitation in this population has already been established.[11–13] Language was not an exclusion criterion.

Each component of the review process was performed independently by 2 reviewers: LTJ and either MEH or MMHL. After removal of duplicates, all titles and abstracts (blinded to authors and journal titles) were screened (LTJ, MEH) using an Excel workbook designed specifically for screening.[19] If studies were not available, authors were contacted to obtain full-text copies. Next, full-text articles were independently screened (LTJ, MEH), and disagreements were discussed until consensus was reached. If necessary, the third reviewer was consulted (MMHL). A list of citations excluded from each step may be requested from the authors.

The following data were abstracted from the selected articles independently by 2 reviewers (LTJ, MMHL): study characteristics (first author, year of publication, study design, country), population (sample size, average age, gender, type of surgery, functional status, level of education, socioeconomic status), a description of the intervention, the duration of the monitoring, and feasibility outcome measures (including definitions as described in the study). Available data relevant to the feasibility assessment included usability, satisfaction, acceptability, willingness to participate (consent or recruitment rate), compliance with eHealth intervention, completion rate of study follow-up, completion of questionnaires, reasons for declining participation, reasons for dropping out, and benefits and barriers to use of the intervention.

The quality of individual studies was assessed with the Methodological Index for Non-Randomized Studies (MINORS)[20] instrument (LTJ, MMHL). The quality of evidence of quantifiable outcome measures usability, satisfaction, acceptability, compliance, and completion rate was assessed using Grades of Recommendation, Assessment, Development, and Evaluation (GRADE)[21] (LTJ, MEH). The primary level of evidence for each outcome is based on designs of the studies that have reported the outcome (eg, randomized controlled trials [RCTs]: high, observational studies: low). This level of evidence can be decreased by 1 (serious) or 2 (very serious) levels in case of risk of bias, heterogeneity in results, indirectness, imprecision, or publication bias. Also, it could be increased by 1 or 2 levels if the outcome has a large effect, large dose response, or all plausible confounding would reduce a demonstrated effect or suggest a spurious effect when results show no effect.[21] Feasibility results were presented in a narrative summary in text and tables. No formal meta-analysis was performed because of the perceived heterogeneity of the data on interventions and outcome measures.

Results

Study Selection

The systematic literature search resulted in 1569 titles and abstracts after removal of duplicates. Seven articles were included after screening and eligibility assessment (Figure 1).

Patient and Study Characteristics

In total, 223 patients were included in 7 studies (Table 2).[22–28] Reasons reported for exclusion of patients were related to type of surgery or disease,[23,24,26–28] insufficient understanding of the required language,[23,25,26] no Internet or smartphone,[25,26,28] and inability to provide consent.[24] Lowres et al.[24] reported exclusion of 4 of 131 patients with impaired cognition, 1 because of impaired vision, and 2 because of mental illness.

Patient characteristics such as functional status and level of education were reported in only 2 of 7 studies. Of the 44 participants in Lowres et al.,[24] 20 (45%) did not complete high school. Granger et al.[22] reported that >60% of their patients had a high performance status. Regarding socioeconomic status, authors mentioned that most patients lived at home with family or support. Other studies did not report patients' functional status, level of education, or socioeconomic status.[22,25–28]

EHealth interventions in all studies could be classified as telemonitoring following oncological, cardiovascular, or orthopedic surgery. The goal of monitoring was detection of postoperative complications in 6 studies[22,23,25–28] and monitoring of physical activity as part of a physical activity and self-management program in 1 study.[24]

All 7 studies were single-center prospective studies performed in Western countries between 2007 and 2019, including 1 comparative study and 6 noncomparative studies.

Four studies were considered to have moderate to high methodological quality, ranging from 13 to 15 of a total of 16.[23–25,28] Three studies were considered to have lower methodological quality, ranging from 9 to 10 of 16 for the noncomparative studies[22,26] and 14 of 24 for the comparative study[27] (Table 3).

Results on Feasibility of eHealth Interventions for Elderly Surgical Patients

The definition and requirements for feasibility of the eHealth interventions varied among the studies. Most studies evaluated feasibility by using multiple outcome measures.[22–25,28] Usability and satisfaction were assessed with questionnaires.[25,27] Feedback was collected from patients to assess the benefits and barriers to use of the intervention using either semistructured interviews[23] or unstructured telephone feedback.[22,26] Three studies also predefined desirable values of participation rate[24] or compliance[23,28] required for feasibility. Results and the quality of evidence per outcome measure

Table 1
Inclusion and Exclusion Criteria

PICOS	Inclusion Criteria	Specification
Patients	- Patients undergoing any type of surgery - Aged [illegible] years and older on average	
Intervention	- eHealth intervention with active patient participation (patients had to be aware and involved in the eHealth intervention) - Related to the perioperative period	*Exclusion:* Telephone consultations as part of the intervention and telerehabilitation following orthopedic surgery *Defined as*: starting before surgery or within 2 wk after surgery
Comparator	- Control group not required	
Outcome	- Assessment of feasibility for older surgical patients	*Defined as*: "A patient's perception of usability, satisfaction, and/or acceptability of a perioperative eHealth intervention" *Assessed by:* - Questionnaires to assess usability, satisfaction and/or acceptability - Qualitative feedback - Compliance with eHealth intervention - Study completion rate - Reasons for declining to participate or dropping out - Benefits and barriers to use of eHealth
Study design	- All prospective interventional and observational studies	*Exclusion:* study protocol, conference abstract, systematic review

(usability, satisfaction, acceptability, and compliance) using GRADE are summarized in Table 4. The initial certainty in the evidence was low for all feasibility outcomes, due to the observational designs of all studies.

Usability

Three studies with a total of 120 patients reported the usability of perioperative eHealth interventions.[22,23,25] Participants indicated the usability of the home monitoring systems as "easy to use" by 89% to 95% of participants[22,23] and gave usability of a mobile health application a score of 4.1 on a 5-point Likert scale.[25] The quality of evidence on usability of eHealth interventions for older surgical patients assessed by GRADE was low.

Satisfaction

Satisfaction with the eHealth invention was assessed in 3 studies.[22,25,27] The average satisfaction score was 8.2 on a scale from 1 to 10 (n = 69).[25] All 9 of the patients in the study by Wynter-Blyth et al.[28] recommended the eHealth intervention to others. In another study, an increase in satisfaction was observed in the intervention group (n = 36) compared with controls (n = 111).[27] The quality of evidence on satisfaction with eHealth interventions for older surgical

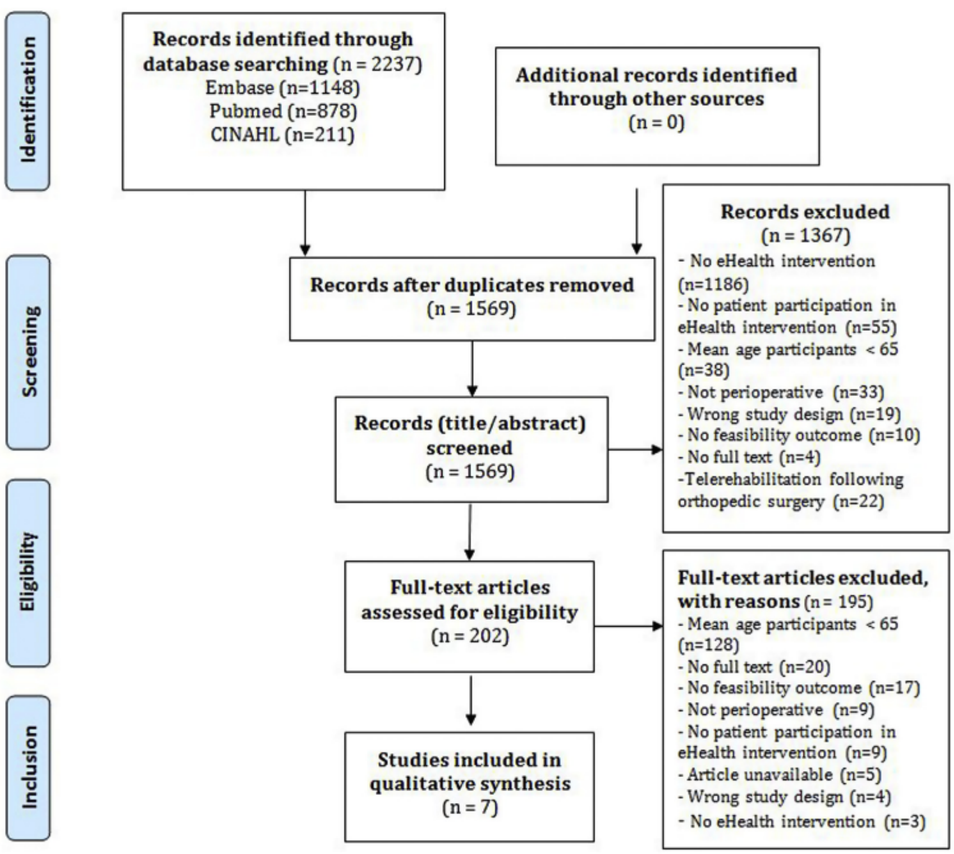

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart.

Table 2
Study Characteristics

Study			Population		eHealth Intervention		Feasibility Outcome Measures
First Author, Year	Country	Design	Sample Size (n); Mean [SD] or Median Age (Range)	Type of Surgery	Description	Monitoring Duration	Outcome Measure (Assessment)
Grange, 2018[22]	Australia	Prospective case series	37; 66 [10]	Lung resection for lung cancer	Physical activity program; home exercises, weekly physiotherapist visits and optional activity monitoring (Fitbit)	Start before or within 2 wk after surgery until 8 wk after surgery.	- Consent rate ≥ 70% - Acceptability (use of Fitbit) - Completion rate - Benefits and barriers
Kleinpell, 2007[23]	USA	Pilot study	10; 74 (range 68–84)	Cardiac surgery	Telemonitoring; weight, BPM, HR, [illegible] saturation via telephone line to Internet server	Postdischarge daily until 3 months after surgery.	- Satisfaction (feedback telephone survey)
Lowres, 2016[24]	Australia	Cross-sectional feasibility study	42; 69 [9]	Cardiac surgery with a transient pAF	Telemonitoring; smartphone and 30-s heart monitor (iECG) to detect recurrence of pAF	Postdischarge 4 times a day for 4 wk.	- Usability (ability to learn and use the device) - Acceptability (recruitment rate) - Compliance - Completion rate - Benefits and barriers
Metcalf, 2019[25]	USA	Prospective pilot study	20; Median 70 (50–91)	Radical cystectomy	Telemonitoring; health care application on tablet, educational videos, activity tracker, weight scale, BPM, pulse oximeter, optional photo function	5 d before surgery, and postdischarge until first visit after surgery.	- Acceptability (consent rate) - Compliance - Completion rate
Palombo, 2009[26]	Italy	Cross-sectional study with control group	eHealth: 36; 72 [8] Control: 111; 72 [7]	Carotid end-arterectomy for carotid stenosis	Telemonitoring; videophone, BPM, antihypertensive drug	Postdischarge every 4 h for 2 d.	- Satisfaction (customer satisfaction questionnaire) - Compliance
Scheper, 2019[27]	The Netherlands	Prospective cohort study	69; Median 68 (33–90)	Joint arthroplasty	Telemonitoring; mobile wound care application; consisting of daily short questionnaires and optional photo function	From day 1–30 after surgery.	- Usability (ease of use and perceived usefulness questionnaire, 5-point Likert scale) - Satisfaction (Scale 1–10) - Compliance - Completion rate
Wynter-Blyth, 2017[28]	England	Small scale feasibility study	9; Median 70	Surgery for esophago-gastric cancer	Telemonitoring; mobile health application, weight scale, pulse oximeter, activity tracker	Before or after surgery for 10 wk.	- Usability - Satisfaction - Benefits and barriers

BPM, blood pressure monitor; HR, heart rate; iECG: iPhone handheld electrocardiogram; pAF, paroxysmal atrial fibrillation.

Table 3
Quality Assessment Using Methodological Index for Non-Randomized Studies (MINORS)

	Granger et al.[24]	Kleinpell et al.[23]	Lowres et al.[24]	Metcalf et al.[25]	Palombo et al.[26]	Scheper et al.[27]	Wynter-Blyth et al.[28]
1. A clearly stated aim	2	2	2	2	2	2	2
2. Inclusion of consecutive patients	2	1	2	2	2	2	1
3. Prospective collection of data	2	2	2	2	2	2	2
4. Endpoints appropriate to the aim of the study	2	[illegible]	2	2	1	2	2
5. Unbiased assessment of the study endpoint	1	0	1	1	0	1	1
6. Follow-up period appropriate to the aim of the study	2	2	2	2	1	2	1
7. Loss to follow-up less than 5%	1	0	2	1	0	1	0
8. Prospective calculation of the study size	2	1	2	2	0	1	1
Items 9–12 only for comparative studies							
9. An adequate control group	-	-	-	-	1	-	-
10. Contemporary groups	-	-	-	-	2	-	-
11. Baseline equivalence of groups	-	-	-	-	2	-	-
12. Adequate statistical analyses	-	-	-	-	1	-	-
TOTAL MINORS score	**14**	**9**	**15**	**14**	**14**	**13**	**10**
Maximum possible score	16	16	16	16	24	16	16

patients was decreased with 1 level to very low due to a serious risk of bias within studies, based on MINORS scores of 14 of 24 for 1 study and a mean of 11.5 of 16 for 2 other studies.

Acceptability (Including Consent Rate to Participate)

In total, 4 studies reported a consent rate to participate of 71% to 89%,[23–25,28] representing a total of 175 patients who consented of 227 patients approached. Only Lowres et al.[24] (n = 42) defined the main outcome measure "acceptability" as study participation rate. The main reported reasons for declining participation were technological problems or lack of required technology (such as WiFi or devices),[23,25,28] feeling overwhelmed due to increased information volume postsurgery,[23,28] perceiving no benefit,[23] or language barrier.[23,25] It should be noted that although 87% of the participants approached by Granger et al.[22] agreed to participate in the physical activity and self-management program, only 46% (17/37) eventually used the activity monitor (Fitbit).

Compliance and Completion Rate

The compliance of patients using eHealth interventions was described in 4 studies with a total of 167 patients.[23,25,27,28] However, studies varied widely in their definitions of compliance, eHealth intervention, and target values, which made it difficult to compare studies. Of note is the difference in compliance between monitoring with an iPhone handheld electrocardiogram (iECGs) and other devices for telemonitoring. In the study by Lowres et al.,[24] 86% of participants recorded data from the iECGs for 27 days or more with a mean of 2.8 iECGs per day (target 3–4 times). On the other hand, 53% of patients in the study by Metcalf et al.[25] synced their steps and recorded all vital signs (temperature, weight, blood pressure, pulse, oxygen saturation) daily for approximately 13 days postoperative, and participants in the study by Scheper et al.[27] synced their data for 64% of postoperative days.

Four studies containing a total of 168 patients reported the completion rate for study follow-up, which ranged from 54% to 95%.[23–25,28] Known reasons for withdrawal were forgetting to fill in the application (n = 6),[25] malfunction of device (n = 3),[25] conflict of

Table 4
Feasibility Outcomes "Usability, Satisfaction, Acceptability, Compliance and Completion Rate" Per Study and the Combined GRADE Level of Evidence Per Feasibility Outcome

	Granger et al.[22]	Lowres et al.[24]	Metcalf et al.[25]	Palombo et al.[26]	Scheper et al.[27]	Wynter-Blyth et al.[28]	GRADE Level of Evidence*
Usability	-	95% "easy to use"	-	-	Mean score "ease of use" 4.2 (day 15 + day 30)	89% (8/9) "easy to use"	Low†
Satisfaction	-	-	-	eHealth-group: Increase satisfaction (good to excellent at day 8)	Mean score 8.2 (day 15)	100% (9/9) "re-commend to others"	Very low‡
Acceptability (consent rate)	89% (42/47) Fitbit-use: 46% (17/37)	76% (44/58)	80% (20/25)	-	71% (69/97)	-	Low§
Compliance	-	Mean 2.8 iECGs/d (target 3–4 daily). 86% used iECG > 27 d	Educational videos 100% ≥ 1 time Sync steps and record vital signs: 53% (8/15)	7 video-connections per patient (target 8)	App: 64% (1317/2070 POD)	-	Very low‖
Completion rate	64% (27/42)	95% (42/44)	75% (15/20)	-	59% (41/69)	-	Low**

GRADE, Grades of Recommendation, Assessment, Development, and Evaluation; iECG, iPhone handheld electrocardiogram; POD, postoperative days.
Kleinpell et al.[23] was excluded from the table content because the study did not describe the included feasibility outcomes.
*The initial certainty in the evidence was low for all feasibility outcomes, due to the observational designs of all studies.
†No level decrease or increase.
‡Level decreased (−1) due to risk of bias (low Methodological Index for Non-Randomized Studies scores individual studies).
§No level decrease or increase.
‖Level decreased (−1) due to heterogeneity in results.
**No level decrease or increase.

intervention with other studies/programs (n = 2),[24] or being too overwhelmed (n = 2).[28] Registered reasons for dropouts were cancellation of surgery (n = 3)[25] or death of the participant (n = 1).[23] The quality of this evidence, as assessed using GRADE, was decreased 1 level to very low due to high heterogeneity of results among studies.

Benefits and Barriers

Three studies including 61 patients mentioned benefits and barriers to use of eHealth interventions.[22,23,26] Benefits mentioned included a feeling of empowerment because of the ability to self-monitor.[22,23] The barriers experienced by participants included the time-consuming aspect of self-monitoring[26] and technical problems of reliability and connectivity.[22,23]

Discussion

Key Points

In this systematic review, we described various feasibility aspects of perioperative eHealth interventions in older surgical patients reported by 7 prospective observational studies. Older surgical patients considered eHealth interventions usable, satisfying, and acceptable, whereas the level of compliance varied widely between studies. Telemonitoring interventions were considered “easy to use” by 89% to 95% of participants and scored 4.1 on a 1 to 5 usability scale and 8.2 on a 1 to 10 satisfaction scale. The acceptability (consent rate), compliance, and study follow-up ranged from 71% to 89%, 53% to 86%, and 54% to 95%, respectively. Patients felt empowered and able to self-monitor, but also experienced time constraints and technical barriers.

Clinical Relevance

Although eHealth applications are used widely in perioperative care[3,29–32] to educate patients preoperatively,[33,34] provide remote monitoring of postoperative recovery,[35,36] and replace postoperative office follow-up,[37,38] their effectiveness is debated because of lack of high-quality comparative data.[39] However, recent RCTs have reported that the use of eHealth applications improved clinical outcomes. Studies reported that eHealth intervention groups had an accelerated return to normal activities after surgery[40] and reduced patient-reported postoperative symptoms[41] compared with patients receiving standard care. Furthermore, the affordability and availability of up-to-date technology offers opportunities to make health care more convenient and cost-effective.[29,42] Perioperative eHealth interventions following various types of surgery produced reductions in costs and hospital visits without an increase in complications.[38,43,44] Telemedicine could also save patients’ time and money by avoiding unnecessary traveling to the hospital[45] and increase patient satisfaction by improving clinical efficiency[46] and supporting patient-doctor communication.[47]

Comparison With Younger Surgical Patients

To the best of our knowledge, the feasibility of perioperative eHealth interventions for the older surgical population has not been previously reported in a systematic literature review. We demonstrated similar results on usability and satisfaction for the older surgical population compared with those previously reported for younger surgical patients.[48–51] The possible benefits and barriers described in our review were also mentioned in a survey of 800 residents of New York City. Participants of all ages answered 2 open-ended questions about possible issues that might be encountered with the use of mobile health applications after an operation.[52] The benefit most frequently cited by both young patients and older respondents (34% of all respondents) was the value of monitoring postoperative recovery. The time-consuming nature of the interventions and technology failure were mentioned as possible barriers by 23% and 5% of the respondents, respectively. Remarkably, age was more often cited as a possible barrier by the responders <65 years old in comparison with the responders ≥65 years old (31% versus 69%, $P = .16$). In addition, more “old” participants responded that they found no barriers to use of postoperative mobile health applications, compared with “young” participants (21% vs 12%, $P = .02$). However, a barrier to the use of eHealth in the postoperative setting reported in 1 of our studies was that older patients might be more overwhelmed by the amount of information provided after surgery[23,28] than their younger counterparts, who are often more familiar with using modern technology.[53]

Benefits and Barriers of eHealth Interventions Among Older Patients

Previous studies about the use of eHealth have generally emphasized the need for user-friendliness, particularly for older patients who are more likely to have visual, auditory, and tactile impairment and decreased learning capability.[53] Examples of ways to improve user-friendliness include large font sizes for text, large icons, easily distinguishable colors in applications,[53] and access to a nondigital form of information.[7] Sociodemographic barriers to use of eHealth, particularly low educational level and lack of social support, also apply to older patients.[7] Older adults who consider the advantages of new technologies relevant and have support from family or peers are more open to learn new technology.[54] Also, in skilled nursing facilities (SNF), where a large number of surgical older patients are discharged to rehabilitation,[55] telemonitoring has been used to provide remote specialized care and reduce readmissions.[56,57] An advantage is that usability issues are less of a problem, as patients are assisted by trained staff of SNFs.[57]

Quality of Evidence

The quality of feasibility results in the reviewed articles is low to very low because of study design, study quality, and heterogeneity of results. Particularly the results of the rates of consent and compliance to the use of eHealth interventions are not conclusive in the studies reviewed. It would have been easier to interpret and compare results on feasibility if appropriate outcome measures and patient characteristics were reported adequately and consistently. In addition to usability, satisfaction, acceptability, and/or compliance, valuable information on feasibility of an eHealth intervention for older surgical patients that could have been considered includes rate of consent to participate, completion rate, and reasons why participants decline participation or drop out of studies.

Strengths and Limitations

The strong point of this review is the focus on a specific population that is often left out of eHealth intervention studies: surgical patients aged 65 years and older. As mentioned before, benefits for this population could be substantial, but researchers should be aware of the differences in usability, acceptability, and satisfaction for eHealth interventions in comparison with a younger population.

A limitation of this review is that a limited number of articles could be considered after meeting all criteria. Studies were included only when their reported feasibility outcomes conformed to our definitions. Therefore, some studies that proved effectiveness of eHealth interventions in cardiac[58–60] or elective orthopedic surgery,[61,62] indicating that these eHealth interventions were also feasible, were not included in the review. Another limitation is that the quality of the studies selected was low due to their observational study design. In addition, we were not able to perform a meta-analysis because of the heterogeneity of the data on intervention and outcome measures. Sample sizes of the studies were small (median sample size 36, interquartile range 10–42), and selection bias was presumably high because patients who were willing to participate were already open to using new digital technology. However, the grading of evidence from feasibility outcomes yields recommendations for better future methodological quality of feasibility studies.

Future Perspectives and Recommendations

Future studies should focus on the possible barriers to implementation of perioperative eHealth interventions, such as provider and patient satisfaction,[30] absence of regulations concerning safety and privacy of eHealth platforms,[63] and exclusion of "patients with low digital literacy."[29] Patients who did not participate with eHealth studies were more likely to be older, underprivileged, and inexperienced with digital technology than patients who participated.[64] To allow for generalization of accessible and feasible perioperative eHealth intervention for the older surgical population, future studies should describe patient characteristics such as functional performance, level of education, and socioeconomic status.

Conclusions and Implications

Analysis of 7 prospective studies that investigated various aspects of feasibility suggests that older surgical patients consider eHealth interventions to be feasible. However, little evidence exists regarding usability of, satisfaction with, and compliance with using eHealth interventions for older surgical patients. This highlights the need for feasibility studies with clear definitions and descriptions of appropriate outcome measures for feasibility. Comprehensive descriptions of patient characteristics are also needed to enhance generalizability of perioperative eHealth studies for older patients.

Supplementary Data

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.jamda.2020.05.035.

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Supplementary Table 1
Search Strategy PubMed Used on July 5, 2019, from January 1, 1999, until July 5, 2019

Search Category	Search Terms
1: Age patients > 65 years	"Aged"[Mesh] OR elderly[tiab] OR older patient*[tiab] OR older person*[tiab] OR older adult*[tiab] OR old patient*[tiab] OR old person*[tiab] OR old adult*[tiab] OR geriatr*[tiab] OR older cancer patient*[tiab]
2: eHealth	"Internet"[Mesh] OR "Telemedicine"[Mesh] OR "Mobile Applications"[Mesh] OR "Smartphone"[Mesh] OR internet*[tiab] OR webbased*[tiab] OR web based[tiab] OR webportal*[tiab] OR online[tiab] OR econsult*[tiab] OR e-consult*[tiab] OR physical activity monitor*[tiab] OR activity track*[tiab] OR stepcount*[tiab] OR app[tiab] OR apps[tiab] OR mobile application*[tiab] OR ediagnos*[tiab] OR e-diagnos*[tiab] OR eHealth*[tiab] OR e-health*[tiab] OR mhealth*[tiab] OR m-health*[tiab] OR mobile health*[tiab] OR remote consult*[tiab] OR Teleconsult*[tiab] OR Tele-consult*[tiab] OR telediagnos*[tiab] OR tele-diagnos*[tiab] OR telehealth*[tiab] OR tele-health*[tiab] OR telemedic*[tiab] OR tele-medic*[tiab] OR telemonitor*[tiab] OR tele-monitor*[tiab] OR teleconsult*[tiab] OR tele-consult*[tiab] OR wearable device*[tiab]
3: Perioperative	"Preoperative Care" [Mesh] OR "Postoperative Care" [Mesh] OR "Peri Operative Nursing"[Mesh] OR "Preoperative Period" [Mesh] OR "Postoperative Period" [Mesh] OR preoperati*[tiab] OR pre-operati*[tiab] OR before operation*[tiab] OR before surg*[tiab] OR pre surg*[tiab] OR presurg*[tiab] OR pre resect*[tiab] OR preresect*[tiab] OR postoperati*[tiab] OR post-operati*[tiab] OR after operation*[tiab] OR after surg*[tiab] OR post surg*[tiab] OR postsurg*[tiab] OR post resect*[tiab] OR postresect*[tiab] OR following surg*[tiab] OR following operat*[tiab] OR perioperati*[tiab] OR peri-operati*[tiab]
4: Publication type	"Review" [Publication Type]
Combined	1 AND 2 AND 3 NOT 4

Supplementary Table 2
Search Strategy EMBASE used on July 5, 2019, from January 1, 1999, until July 5, 2019

Search Category	Search Terms
1: Age patients > 65 years	'elderly care'/de OR 'aged'/exp OR Elder*:ti,ab OR ((old OR older) NEXT/3 (patient* OR person* OR adult*)):ti,ab OR geriatr*:ti,ab
2: Perioperative	'postoperative period'/de OR 'postoperative care'/de OR 'preoperative care'/exp OR 'postoperative':ti,ab OR 'preoperative':ti,ab OR (before OR pre OR post OR after OR follow*) NEXT/4 (operat* OR surg* OR resect*):ab,ti OR 'postsurgery':ti,ab
3: eHealth	('internet'/de OR 'telehealth'/exp OR 'mobile application'/exp OR 'mobile phone'/exp OR 'internet':ti,ab OR 'webbased':ti,ab OR 'web-based':ab,ti OR 'webportal':ti,ab OR 'online':ti,ab OR 'econsult':ti,ab OR 'e-consult':ti,ab OR 'physical activity monitor':ti,ab OR 'activity tracker':ti,ab OR 'step count':ti,ab OR 'app':ti,ab OR 'apps':ti,ab OR (mobile NEXT/2 application*):ti,ab OR 'ediagnosis':ti,ab OR 'eHealth':ti,ab OR 'e-health':ti,ab OR 'mhealth':ti,ab OR 'm-health':ti,ab OR 'mobile health':ti,ab OR 'remote consult':ti,ab OR 'Teleconsult':ti,ab OR 'Tele-consult':ti,ab OR 'telediagnosis':ti,ab OR 'tele-diagnosis':ti,ab OR 'telehealth':ti,ab OR 'tele-health':ti,ab OR 'telemedicine':ti,ab OR 'telemonitor':ti,ab OR 'tele-monitor':ti,ab OR 'teleconsult':ti,ab OR 'tele-consult':ti,ab OR 'wearable device':ti,ab))
4: Publication type	'review'/de
Combined	1 AND 2 AND 3 NOT 4

Supplementary Table 3
Search strategy CINAHL used on July 5, 2019, from January 1, 1999, until July 5, 2019

Search Category	Search Terms
1: Aged patients > 65 years	(MH "Health Services for the Aged") OR (MH "Aged+") OR (MH "Gerontologic Care") OR old* N3 (patient* OR person* OR adult* OR geriatr*)
2: Perioperative	(MH "Postoperative Care") OR (MH "Preoperative Care+") OR (MH "Postoperative Period") OR (MH "Preoperative Period") OR postoperati* OR preoperati* OR ((before OR pre OR post OR after OR follow*) N4 (operat* OR surg* OR resect*)))
3: eHealth	(MH "Internet+") OR (MH "Telehealth+") OR (MH "Telemedicine+") OR (MH "World Wide Web Applications+") OR (MH "Mobile Applications") OR (MH "Cellular Phone+") OR (MH "Fitness Trackers") OR (MH "Wearable Sensors+") OR (MH "Home Care Equipment and Supplies")
4: Publication type	review (publication type)
Combined	1 AND 2 AND 3 NOT 4