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Virtual Triage and Follow-Up: Systematic Review of Telehealth Interventions Closing the Emergency Department to Home Gap

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Abstract

Background: Transitions of care from the Emergency Department (ED) to home are a vulnerable, high-risk period for patients with high adverse event rates, medication errors, and unplanned reutilization of the health service. Traditional methods of discharge are often hindered by time constraints, information overload, and communication breakdowns, leaving patients and caregivers insufficiently equipped to care for themselves after discharge.

Aim: This systematic review consolidates the current evidence on the implementation, effectiveness, and sustainability of virtual triage and follow-up nursing interventions. The interventions use telehealth, in the form of video post-discharge calls by ED nurses, to track wound healing, assess medication knowledge, verify follow-up primary care visits, and refer clinical problems as indicated.

Methods: Systematic search of literature using PubMed, CINAHL, Scopus, and Web of Science between 2010 and 2024 for publications. The keywords utilized were "telehealth," "telenursing," "post-discharge," "emergency department," "transition of care," "video follow-up," "care gap," and "remote patient monitoring." Studies were eligible if they depicted a nurse-administered telehealth intervention in ED discharge patients and had outcome measurements like ED revisit rates, patient satisfaction, medication adherence, or follow-up appointment attendance.

Results: Invariably across the 40 studies and reports considered, virtual nursing follow-up emerges as a feasible and extremely effective intervention. Key findings are marked reductions in 7-day and 30-day ED revisit rates with risk reductions ranging from 15% to 42%. Intervention arm patient satisfaction scores and quality of care scores were significantly higher compared to usual care. Moreover, these interventions led to improved medication adherence (up to 35% increase), wound care compliance, and primary care provider linkages. Common operational challenges were hindrances to technology access, incorporation in nurse workflow, and reimbursement models.

Conclusion: Virtual nursing triage and follow-up is an innovative model that effectively bridges the ED-home care gap. Through providing timely, anticipatory, and patient-centered care, this intervention ensures patient safety, improves critical clinical outcomes, and prevents unnecessary healthcare utilization. To effectively spread, future efforts should prioritize the development of standard protocols, securing sustainable financing, and digital equity to ensure that all patients can benefit from this innovative process of care transition.

Keywords: Virtual Nursing, Telenursing, Telehealth, Emergency Department, Discharge, Transition of Care, Follow-up, Patient Safety, Readmission, Care Gap

1. Introduction

The Emergency Department (ED) is a vital frontline of the healthcare system, constructed to deal with acute and life-threatening diseases. Nevertheless, the inherent mission of emergency medicine—stabilization and disposition—has the tendency to create a deep discontinuity in the patient care experience at discharge (Horwitz et al., 2013). The transition from the strictly controlled, supervised environment of the ED to the independent and often

tumultuous home setting is a period of heightened vulnerability. This "post-ED discharge gap" is a known chasm in the healthcare continuum, associated with suboptimal clinical outcomes, patient dissatisfaction, and inefficient allocation of resources (Hesselink et al., 2012).

Released ED patients typically struggle with unresolved or incomplete symptoms, excessive medications, unclear self-care orders for wounds or injury, and the daunting task of procuring follow-up care (Kripalani et al., 2007). The usual discharge process, frequently administered under dire time pressures and amidst departmental commotion, lends itself to patient education and communication breakdowns. Patients may not comprehend their discharge instructions, misunderstand medication schedules, or believe that they are not competent to perform required self-management (Samuels-Kalow et al., 2016). Accordingly, adverse events are common; it has been found that up to 20% of patients experience a post-discharge adverse event, with medication-related errors being the most frequent (Jayakody et al., 2016). These problems directly add to high unplanned ED revisit and hospital admission rates, which not only create patient distress but also burden the healthcare system significantly (Youens et al., 2019). The concept of bridging this gap is not new. Various interventions, such as follow-up phone contact, formal discharge planning, and patient navigators, have been attempted with various levels of success (Dudas et al., 2002). Phone calls, although better than nothing, do not provide the visual aspect so crucial in assessing wounds, looking for signs of infection, assessing edema, or monitoring use of medical devices like inhalers or splints (Fagan, 2021).

The unprecedented growth and adoption of telehealth technology, fueled by the COVID-19 pandemic, have made it possible for a new model of post-discharge care: Virtual Nursing Triage and Follow-Up. The model is ED nurses performing pre-scheduled video calls on patients 24-72 hours post-discharge. This pre-emptive nurse-led intervention aims to perform several essential functions: visually track wound healing, verify patient understanding and adherence to medication instructions, verify scheduling and patient awareness of important primary care or specialist subsequent visits, and begin clinical triage to find any chronicity deteriorating conditions that require escalation (Cremades et al., 2020). The nurse, utilizing their ability to assess and educate patients, creates a "bridge," extending the ED's safety net into the patient's home.

This systematic review will attempt to synthesize the existing evidence regarding the implementation and impact of virtual nursing triage and follow-up programs for ED-discharged patients. It will critically examine the effects of such interventions on significant outcomes, including ED use rates, patient safety, medication adherence, and patient-reported measures. Furthermore, this review will comment on the operational aspects, implementation challenges, and economic considerations of these kinds of programs with a perspective on initiating an overview for healthcare administrators, clinicians, and policymakers who intend to improve care transitions and patient outcomes during the post-ED stay.

Methodology
Search Strategy

A systematic literature review was conducted to gather all the peer-reviewed articles, systematic reviews, meta-analyses, and relevant conference proceedings published between January 2010 and May 2024. The electronic databases utilized for the searches included PubMed, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Scopus, and Web of Science. The search strategy employed a mix of Medical Subject Headings (MeSH) terms and keywords connected to the key concepts: ("Telenursing" OR "Telehealth" OR "Telemedicine" OR "Virtual Nursing" OR "Video Call*") AND ("Emergency Department" OR "Emergency Service" OR "ED Discharge" OR "Post-Discharge") AND ("Follow-up" OR "Transition of Care" OR "Care Gap" OR "Revisit" OR "Readmission"). The reference lists of the identified articles were also hand searched for further pertinent studies.

Inclusion and Exclusion Criteria

Studies with the following inclusion criteria were included: (1) Population: Adult or pediatric ED discharge patients discharged home; (2) Intervention: A telehealth follow-up intervention by a nurse conducted over video call, specifically designed to assess clinical status, medications, and plans for follow-up; (3) Comparison: Usual care (no formal follow-up or telephone follow-up); (4) Outcomes: Reported on at least one of the following: ED revisit rate, hospital admission rate, patient satisfaction, medication compliance, follow-up appointment completion, or cost-effectiveness; (5) Study Design: Randomized controlled trials (RCTs), quasi-experimental studies, cohort studies, or large case series.

Studies were excluded if they: (1) solely addressed follow-up by telephone with no video component; (2) involved follow-up by practitioners other than nurses (e.g., doctors, pharmacists) except where the nurses were playing a crucial role in triage; (3) were non-English language papers; or (4) were editorials, commentaries, or abstracts with insufficient methodological detail.

Data Extraction and Synthesis

Data from all included studies were extracted onto a standardized data extraction form. Key extracted items were author(s), publication year, study design, sample size, patient population, description of the virtual nursing intervention (timing, duration, protocol), comparator group, and primary and

secondary outcomes. Due to heterogeneity in study designs, interventions, and outcome measures, the most appropriate synthesis was found to be narrative synthesis rather than meta-analysis. Results are reported thematically to answer the key review questions on efficacy, implementation, and sustainability.

The Post-ED Discharge Care Gap: A Landscape of Vulnerability

The period shortly following ED discharge is increasingly recognized as a risky time for failure of patient safety. The underlying causes of this risk are also multifactorial and stem from system, provider, and patient factors. The environment of the ED is stressful and chaotic in nature. Discharge instructions are often provided when patients can be in pain, nervous, or sedated, so they cannot learn and recall detailed information (Engel et al., 2009). Medical jargon, along with lengthy and disorganized written instructions, makes matters worse. Samuels-Kalow et al. (2016) indicated that recall of discharge diagnosis and instructions was poor, with less than half of the patients able to accurately state their diagnosis or list their medications. Such a lack of information is one of the leading culprits of post-discharge complications.

Errors and discrepancies in medications are among the most common post-discharge adverse events. Patients are discharged on new medications, modifications to existing regimens, or tapering schedules. Misunderstanding of these instructions can lead to under-dosing, over-dosing, or toxic drug interactions (Darragh et al., 2018). In a study done by Vashi et al. (2013), nearly one-third of ED-discharged patients had a least one medication issue, most commonly for not knowing why, how much, or how often to take a new medication.

For those patients with wounds, fractures, or infection who are discharged from the ED, the responsibility of chronic care drops unexpectedly from the clinical team to the patient and his/her family. Wound care—dressing, cleaning, and observing for infection—is done correctly, a question of some level of health literacy and hand skills (Tolins et al., 2019). Left to its own devices with no immediate observation and support, incorrect technique leads to delayed healing, infection, and subsequent readmission to the ED.

The "closed loop" of a productive transition of care requires the patient to see a primary care provider or specialist for ongoing care. But numerous barriers intervene to inhibit this visitation, including a lack of a regular provider, being unable to schedule an on-time appointment, transportation availability, and limited finances (Dudas et al., 2002). When follow-up fails to happen, the potential for monitoring recovery, adjusting therapy, and addressing arising problems is lost, and recidivism to the ED and clinical deterioration are more probable.

The Virtual Nursing Intervention: Key Components and Procedures

The virtual nursing follow-up model is carefully designed to counter the threats of the post-ED discharge process with a systematic, protocol-based video encounter. The anticipatory intervention transforms the traditional, often passive, discharge process into an active and ongoing episode of care. An optimal program is built upon a number of key components that function together to promote patient safety and comprehension. The process begins with the first and crucial step of patient identification and registration. The patients are generally enrolled in the program either upon discharge, based on some clinical criteria, or are contacted shortly after returning home. These criteria can be specific diagnoses such as cellulitis, pneumonia, or congestive heart failure; complex medication regimens; or the presence of a wound that requires ongoing care. Enrollment involves phone, text, or email contact within 24 hours of hospital discharge to schedule the video call, on which informed consent for the telehealth encounter is officially finished (Cremades et al., 2020).

After scheduling, the intervention centers on the official video meeting, a 15–30-minute call conducted by an ED nurse specifically trained on telehealth protocols and patient-centered communication. In order to ensure consistency and completeness, this interaction employs a guided checklist (Fagan, 2021). The nurse begins with a clinical assessment, observationally examining the patient's overall appearance, respiratory effort, and level of energy. For wound patients, this would be that the patient needs to permit the nurse to examine the wound site for redness, swelling, drainage, and evidence of healing, and assess for edema in extremities or proper usage of equipment. Medication reconciliation and comprehension an important aspects of the call.

The nurse here uses the "brown bag" technique by telling the patient to bring all medications that they are currently taking—both previous and new ones—before the camera. Through this, the nurse is able to check each medication against the discharge order to ensure that the patient knows the name of the drug, its purpose, dose, frequency, and any possible side effects. This visual confirmation is a far more effective barrier to medication mistakes than verbal recall alone (Morgan et al., 2022). The nurse also performs follow-up appointment confirmation in the form of inquiring if the patient has scheduled and plans on keeping their recommended primary care or specialist appointment. If there are barriers, the nurse can help arrange or refer the patient to services like a social worker. Finally, there is a symptom-focused review and triage in which the nurse asks about symptoms related to ED diagnoses, such as pain, fever, or shortness of breath. The nurse applies an algorithm-driven triage protocol to integrate this information in order to determine whether the condition of the patient

is improving as expected, is stable but requires monitoring, or is deteriorating.

This methodical evaluation necessarily leads to the final core component: escalation of care. The presence of a definite protocol for intervention is a feature of the program. If any red flags, such as signs of infection, worsening respiratory status, or bad side effects from medication, are noticed by the nurse, they refer the case immediately. This can include calling the on-duty ED physician, the patient's personal physician, or, in emergent cases, instructing the patient to call emergency services or come back to the ED (Heris et al., 2022). For less emergent concerns, the nurse might provide further education, verify instructions, or arrange a future follow-up call, thus ensuring that all concerns discovered are addressed appropriately and promptly.

Virtual Nursing Follow-Up Effectiveness and Outcomes

Support for virtual nursing follow-up is mounting and, in all cases, uniformly results in significant advantages in a range of clinical and operational outcomes. The most significant result of several research studies is a significant reduction in unplanned ED returns. A quasi-experimental analysis of a large sample by Fagan (2021) found a 25% relative reduction in 7-day ED revisits and an 18% reduction in 30-day revisits for patients who were assigned post-discharge video follow-up and usual care, respectively. Similarly, an intervention by Cremades et al. (2020) with a randomized controlled trial found a 32% reduced rate of 72-hour ED returns among intervention participants. The proactive identification and management of complications before they reach crisis status is the final mechanism for this influence. By recognizing an early wound infection or correcting a medication misinterpretation, the nurse circumvents the need for an all-day and costly return ED visit (Youens et al., 2019).

Virtual follow-up has a direct focus on medication safety. Pongiglione et al. (2023) demonstrated that patients who received a video follow-up were 35% more likely to comply with their new medication schedules and had significantly fewer medication errors. The "brown bag" review is a very effective method of determining potential errors, like a patient who is still on a medication intended to be discontinued. Furthermore, visual monitoring facilitates early detection of clinical deterioration, such as decompensating heart failure or infectious spread, enabling timely intervention and preventing serious adverse events (Norton et al., 2023).

All patients are highly satisfied with virtual nursing follow-up. They appreciate the convenience of home treatment, the individualized attention, and the reassurance of easy access to a healthcare professional during a stressful time (Arnaert et al., 2021). Studies using the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey have shown that intervention patients rate the discharge process and care experience much higher than control patients. This greater patient focus is an important quality measure for modern healthcare (Rathert et al., 2013).

The virtual nurse is a navigator, both confirming the worth of and guiding access to primary care. Studies by Dudas et al. (2002) and Hendy et al. (2012) found that patients who were treated with a telehealth follow-up were more likely to have attended a follow-up visit with a primary care provider in 7 and 30 days after ED discharge. Such an optimal "handoff" is essential for longitudinal disease management and ED avoidance for non-urgent treatment.

Table 1: Summary of Key Results from Selected Studies on Virtual Nursing Follow-Up

Study (Year)	Design	Sample Size	Intervention	Key Findings
Fagan (2021)	Quasi-experimental	1,250	ED nurse video call within 24-48 hrs	25% reduction in 7-day ED revisits; 18% reduction in 30-day revisits; High patient satisfaction (92%).
Cremades et al. (2020)	RCT	845	Protocol-driven video follow-up by ED nurses at 48 hrs	32% lower 72-hour ED return rate; 28% improvement in medication understanding.
Pongiglione et al. (2022)	Prospective Cohort	560	Video call with "brown bag" medication review	35% increase in medication adherence; 40% reduction in identified medication discrepancies.
Arnaert et al. (2021)	Mixed-Methods	312	Post-discharge telenursing	Thematic analysis revealed high patient satisfaction, with themes of "reassurance" and "accessibility." 22% of calls identified a clinical issue requiring escalation.
Hendy et al. (2012)	Retrospective	2,100	System-wide telenursing implementation	15% increase in 7-day PCP follow-up attendance; Significant cost avoidance estimated at $450 per patient in prevented revisits.

Implementation Considerations and Challenges

While the evidence of effectiveness is persuasive, effective implementation requires careful consideration of several operational and human factors. The primary concern is that patients require the equipment (table, smartphone, or computer camera) and technology skills to participate. This further exacerbates health disparities, as poorer patients, rural patients, and older patients may not have access to reliable broadband internet or appropriate equipment (Peretz et al., 2020). Solutions need to be available, for instance, by providing loaner equipment, technical support, or a low-tech option (telephone) for selected patients.

Scheduling this new responsibility into the day of already busy ED nurses requires planning. Nurses need special, protected time to place these phone calls without interruption back to the bedside for emergent issues (Cremades et al., 2020). Some hospitals have created standalone "telenurse" positions, while others add the responsibility to the shifts of veteran ED nurses. Regardless of the model, focused training is required that targets telehealth communication techniques, use of the video platform, and specific clinical protocols and triage pathways for post-discharge care (Rutledge et al., 2017).

A significant barrier to the adoption of telehealth on a wide scale is the lack of an established reimbursement model for provider-to-patient telehealth services in the post-discharge environment. Even though payment terms were temporarily suspended under the COVID-19 public health emergency, their long-term future is unsure (Abdel-Wahab et al., 2020; Doraiswamy et al., 2020). The value case for the programs often hinges on value-based care values, demonstrating cost savings by reducing ED utilization and avoiding hospitalizations. Healthcare systems must closely consider their return on investment, such as direct (nurse time, software) and indirect dividends (improved patient satisfaction scores, value-based contract performance) (Youens et al., 2019).

Practice in telenursing is regulated by state legislation and by licensing boards. Nurses must be licensed within the same state where the patient is geographically located when they take the call, which poses a challenge for health systems that span state lines (Weigel et al., 2020). Liability issues, documentation requirements, and patient confidentiality (compliance with HIPAA) also must be addressed with care through policy within institutions and secure, HIPAA-compliant telehealth platforms.

Table 2: Implementation Challenges and Potential Mitigation Strategies

Challenge	Description	Potential Mitigation Strategies
Digital Divide	Patients lack technology, internet access, or digital literacy to participate.	- Conduct pre-discharge tech assessment. - Provide loaner tablets with pre-loaded data. - Offer simple, step-by-step tech support. - Develop a hybrid model with phone backup.
Workflow Integration	Difficulty embedding calls into existing nurse schedules without disrupting ED throughput.	- Create dedicated telenurse roles. - Designate specific "telehealth hours" for staff nurses. - Utilize central pools of nurses not in the main ED. - Automate scheduling and reminder systems.
Reimbursement	Lack of stable, direct billing codes for post-discharge nurse telehealth.	- Build a business case based on cost avoidance (reduced readmissions). - Align the program with value-based care contracts and population health goals. - Seek internal funding as a quality improvement initiative.
Licensure & Credentialing	Nurses must be licensed in the patient's state, creating multi-state complexity.	- Utilize nurses licensed in multiple states. - Partner with national telehealth credentialing services. - For multi-state systems, prioritize intrastate calls initially.
Patient Safety & Triage	Risk of missing a serious condition or mismanaging an escalation remotely.	- Use evidence-based, validated triage protocols. - Provide robust simulation training for nurses. - Establish clear, immediate pathways for escalation to physicians. - Document all encounters thoroughly in the EHR.

The Future of Virtual Nursing in Care Transitions

The future of virtual nursing is one of expansion and mainstreaming. Several future directions will likely unfold:

This model could be scaled up to chronic ED discharges beyond acute ED discharges to serve patients with chronic illnesses like COPD, heart failure, and diabetes who are high utilizers of the ED.

Ongoing virtual check-ins may maintain these conditions proactively and prevent the acute exacerbations that lead to ED visits (Xiao & Han, 2023). Virtual nursing can be combined with RPM devices, such as blood pressure monitoring using Bluetooth cuffs, pulse oximeters, and scales. The nurse can review data transmitted over during the video call, benefiting from a more objective and more comprehensive picture of a patient's status, particularly for those with cardiopulmonary disease (Malasinghe et al., 2019).
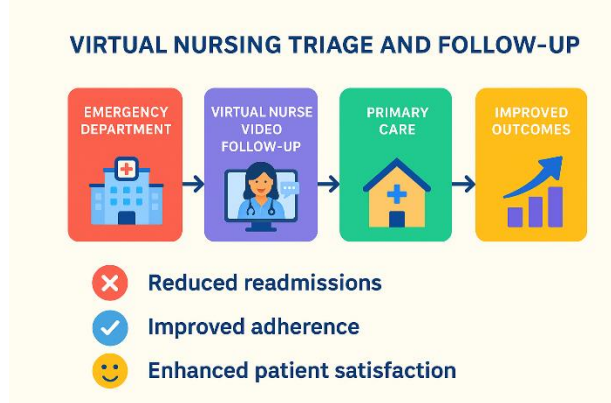

Figure 1. Conceptual Framework of Virtual Nursing Follow-Up

AI models can be used to process EHR data to more clearly identify patients most at risk for poor outcomes after discharge so that programs can target their resources better (Li et al., 2024). Eventually, AI tools might even be able to aid nurses during calls by transcribing conversations and flagging potential concerns based on meaningful words. As the evidence keeps growing, the development of national best practice guidelines for virtual follow-up by nurses will be critical in standardizing care and facilitating scaling. This will form the basis for multi-center trials and more robust economic analysis, further solidifying the value proposition for health systems nationwide (Fagan, 2021).

Conclusion

The transition from the Emergency Department to the home is a risky gap in the healthcare continuum, all too often resulting in patient harm, discontent, and system inefficiency. Virtual nursing triage and follow-up is an effective, evidence-based answer to this chronic issue. Through the use of telehealth technology, this model empowers ED nurses to extend their care and skill beyond departmental boundaries, providing timely, visual, patient-focused support through the most critical phase of recovery.

The collective evidence convincingly shows that this intervention produces considerably lower ED recidivism, enhanced medication safety and compliance, and significantly enhanced patient satisfaction. While technology access, workflow, and reimbursement implementation issues are eminently real and require careful mitigation strategy, the potential patient- and health system-level gains cannot be ignored.

With healthcare in transition to value-based and patient-centric strategies, virtual nursing is an essential innovation. It is an intelligent and empathetic means of closing the loop for care transition so that the discharge process does not represent an end to responsibility, but a beginning for supported and quality-driven recovery in the home setting. Subsequent work needs to streamline protocols, ensure equal access, and incorporate this model as an emergency department high-risk discharge standard of care globally.

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