

## Effectiveness of Remote Triage: A Systematic Review

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## PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted health care topics of importance to clinicians, managers, and policymakers as they work to improve the health and health care of Veterans. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The program is comprised of four ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee comprised of health system leadership and researchers. The program solicits nominations for review topics several times a year via the [program website](#).

Comments on this evidence report are welcome and can be sent to Nicole Floyd, Deputy Director, ESP Coordinating Center at [Nicole.Floyd@va.gov](mailto:Nicole.Floyd@va.gov).

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## ACKNOWLEDGMENTS

This topic was developed in response to a nomination by Jennifer MacDonald, MD, Office of Connected Care for the purpose of developing an enterprise master plan for clinical contact center optimization. The scope was further developed with input from the topic nominators (*ie*, Operational Partners), the ESP Coordinating Center, the review team, and the Technical Expert Panel (TEP).

In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

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### **Operational Partner**

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend TEP participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

Jennifer MacDonald, MD  
Clinical Lead  
Office of Connected Care

### **Technical Expert Panel (TEP)**

To ensure robust, scientifically relevant work, the TEP guides topic refinement; provides input on key questions and eligibility criteria, advising on substantive issues or possibly overlooked areas of research; assures VA relevance; and provides feedback on work in progress. TEP members are listed below:

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**Peer Reviewers**

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or nonfinancial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

# EXECUTIVE SUMMARY

## INTRODUCTION

The US health care system currently faces several challenges including caring for an increasing elderly population, a large numbers of patients with multiple chronic conditions, and an uneven distribution of primary care providers across the country. The full appointment schedules of many primary care physicians compound this workforce shortage, making it challenging for many patients to access acute and chronic care within a primary care setting. Additionally, many patients experience multiple structural, financial, and logistical barriers to receiving timely care. In rural areas, for example, patients face challenges posed by distance to providers, decreased numbers of providers, and a lack of public transportation infrastructure to facilitate attending appointments.

Such access challenges may lead people to seek acute or chronic care in settings such as emergency departments (EDs) when their needs could have likely been addressed in a primary care setting. Increasingly, acute care visits take place outside of the primary care setting. Yet patients who have access to after-hours care at their usual primary care practice have lower rates of higher level care utilization. One way of providing patient access to the appropriate level of care is through technology-based systems that facilitate remote decision-making. Remote decision-making is defined as making clinical decisions in the absence of a face-to-face encounter. Further, remote decision-making can overcome barriers such as demand for in-person clinical services.

The implementation of any technology-based system is complex and requires evaluation of many factors at the patient, provider, and organizational levels. Factors related to the successful planning of such a system include the specific clinical and population contexts, the ability to sustain the process, and legal considerations around remote medical decision-making. Specific issues related to the execution of such a system include adaptability, complexity of the system, costs, external forces like incentives, and internal forces like supportive resources. Such systems have been successfully implemented in the United Kingdom, where patients requesting a same-day appointment by telephone are assessed and triaged to the appropriate level of care. Prior systematic reviews have reported that more research is necessary to determine the impact of triage and telephone consultation with patients on clinical outcomes, costs, and subsequent care utilization.

As the country's largest integrated health system, the Veterans Health Administration (VHA) has a mandate to care for Veterans across the entire United States and associated territories. Veterans established within VA may still experience barriers to accessing care, including multiple health comorbidities that limit travel, transportation concerns, or the need to access care after normal primary clinic hours. Thus, technology-based solutions to improve access are of significant interest in meeting VA's responsibility "to care for [those] who shall have borne the battle." Additionally, the recently passed MISSION Act specifically identifies telehealth via telephone or computer as channels for Veterans to receive timely care. At the request of the VA Office of Connected Care, we therefore conducted a systematic review to address the following key questions (KQs):

**KQ 1:**

- A. For adults, what are the effects of remote triage on health care utilization, case resolution, patient safety, patient satisfaction, and cost?
- B. What is the impact of remote triage by different modalities (*eg*, telephone, video, web, short message service [SMS])?

**KQ 2:** What are the identified best practices that impact the planning, execution, and evaluation of remote triage for adults seeking clinical care advice in a large-scale health system such as the VA?

**KQ 3:** What are the types of outcomes used to assess the impact of remote triage?

## METHODS

We developed and followed a standard protocol for this review in collaboration with operational partners and a Technical Expert Panel (PROSPERO registration number CRD42019112262).

### Data Sources and Searches

We searched MEDLINE® (via PubMed®), EMBASE, and CINAHL, from inception through July 27, 2018. We conducted one primary literature search for KQ 1 and KQ 3 and a different search for KQ 2. We also examined the bibliographies of recent reviews for additional relevant studies.

### Study Selection

In brief, the major eligibility criteria for KQ 1 and KQ 3 were randomized or nonrandomized studies of remote triage services that reported health care utilization, case resolution, patient safety, patient satisfaction, or cost outcomes. For KQ 2, we also included additional qualitative studies, mixed-method studies, organizational case studies, and systematic reviews addressing best practices for implementing remote triage. Remote triage services were defined as services pertaining to the initial assessment and management of acute, undifferentiated, or unscheduled care that were initiated by a patient or family member from a distance and were focused on a clinical care issue. Using prespecified inclusion/exclusion criteria, investigators and the DistillerSR Artificial Intelligence tool (DistillerSR; Evidence Partners Inc., Manotick, ON, Canada) evaluated titles and abstracts to identify potentially eligible studies. Studies that met all eligibility criteria at full-text review were included for data abstraction.

### Data Abstraction and Quality Assessment

Key characteristics abstracted for KQ 1 were patient descriptors (*eg*, age, sex, insurance type), intervention characteristics (*eg*, triage professional type, delivery modality, key triage system characteristics, decision protocols or support software), comparator, and outcomes. For studies relevant to KQ 2, we abstracted emerging practices for the implementation of remote triage services including insights into personnel, processes, and technologies needed to establish remote triage and implications for what works well and what does not in delivering remote triage services. For KQ 3 we abstracted the measures and metrics used to evaluate remote triage systems.

For KQ 1 and KQ 3 studies, we assessed risk of bias (ROB) using the Effective Practice and Organization of Care (EPOC) guidance. For KQ 2 studies, we used ROB appraisals customized

to the specific study design. Summary ROB ratings could only be assessed using the EPOC tool and are defined as follows: low ROB is assigned to studies where bias, if present, is unlikely to alter the results seriously; unclear ROB is assigned to studies where the risk of bias raises some doubts about the results; and high ROB implies that bias may alter the results seriously.

## Data Synthesis and Analysis

For KQ 1, we describe the included studies using summary tables and graphical displays. We were unable to compute summary effects (*ie*, meta-analysis) because of conceptually heterogeneous studies. Thus, we analyzed the data narratively. We gave more weight to the evidence from higher quality studies with more precise estimates of effect. When possible, we present forest plots of the point estimates of individual studies, grouped by the overall type of comparison drawn in each study.

We analyzed potential reasons for inconsistency in treatment effects across studies by evaluating differences in the study population, intervention, comparator, and outcome definitions. Certainty of evidence (COE) was assessed for outcomes critical to decision-making using the approach described by the Grading of Recommendations Assessment, Development and Evaluation working group (GRADE).

For KQ 2, 3 co-investigators (JMG, AAL, SR) with experience in qualitative methodology led the abstraction and analysis of data collected. Using the KQ 2 question as a guide, we created an *a priori* framework developed in collaboration with our stakeholders and Technical Expert Panel. This framework included 3 *phases* of emerging practices: planning, execution, and evaluation, and 3 *aspects* of emerging practices: people, processes, and technology. The creation and identification of codes and themes were iterative; to ensure rigor and validity of these findings, the 3 co-investigators independently coded and then discussed the codes, definitions for each code, and the themes until they reached consensus.

For KQ 3, we categorized the types of metrics used to evaluate the impact of remote triage services reported by studies that met inclusion criteria for KQ 1. We adapted 6 categories developed by Carrasqueiro et al: (1) enhanced access to care; (2) change in rates or trends of services use or change in professionals' workload; (3) adverse events (deaths, emergency department attendance, hospital admissions) and delayed care; (4) clinical outcomes after triage; (5) patient satisfaction measured via Likert scales; and (6) savings from avoided services use and triage costs.

## RESULTS

### Results of Literature Search

The literature search identified 5,026 articles relevant to KQ 1 and KQ 3 and 6,911 articles relevant to KQ 2. In total, 100 references were reviewed at the full-text stage for KQ 1 and KQ 3, whereas 330 were reviewed for KQ 2. Nine studies relevant to KQs 1 and 3 were retained for abstraction, and 32 were retained for KQ 2. Six of these studies were included in all 3 KQs. The studies all were conducted in Europe or Australia. The systematic reviews included in KQ 2 reported on studies conducted in multiple countries including the United States, Canada, and New Zealand.

## Summary of Results for Key Questions

### KQ 1

Nine studies evaluated 3 comparisons of remote triage services: mode of triage delivery (*ie*, telephone, in-person), triage professional type (*eg*, nonclinical call handler, nurse, general practitioner [GP]) and organizational level of triage system (*eg*, national triage systems, local in-practice triage systems). No eligible studies evaluated any other triage delivery mode beyond telephone and in-person. Of the 9 studies, 5 were RCTs, 3 were controlled before-after studies, and 1 was an interrupted time-series study. Of the RCTs, 1 was randomized at the individual level and 4 were cluster-randomized clinical trials. Eight studies assessed the effects of remote triage on health care utilization. Four studies assessed the effects of remote triage on case resolution (*ie*, the health issue or concern was resolved during initial contact with the triage system). Two trials addressed the effects of remote triage on patient safety. Four studies assessed the effects of remote triage on patient satisfaction. Three studies assessed the effects of remote triage on cost.

Key findings include the following:

- The majority of included studies *did not* demonstrate a decrease in primary care or emergency department (ED) use; however, the current evidence is limited and of marginal quality.
  - Only 1 study with high ROB found a significant decrease in primary care utilization when comparing a national telephone triage system to a more local telephone triage system, and no study found a decrease in ED utilization.
  - Yet, 4 studies reported significant *increase in utilization* among patients in the remote triage condition.
- Evidence from 2 studies suggested that local, practice-based telephone triage services have higher case resolution outcomes and refer fewer patients to emergency or primary care services compared with regional/national telephone-based remote triage.
- While we also explored safety outcomes including ED visits, emergent hospitalization, and death, neither of the 2 studies identified statistically significant differences in safety outcomes among study arms.
- No clear pattern emerged about the effects of remote triage on patient satisfaction. Some evidence supports that patient satisfaction is affected to the degree that patients perceive the service they receive to differ from the service they expected (*eg*, same-day vs after-hours advice).
- Last, we addressed the comparative costs of a telephone triage system. Two studies evaluated the costs of in-person primary care compared to either GP-led or nurse-led telephone triage and found no difference in overall cost of care. A third study compared a national telephone triage system to a local triage system, finding that overall cost was not different when controlling for the triaged patient's final point of health care contact.

### *Rating of the Body of Evidence for KQ 1 Key Outcomes*

Our stakeholders identified health care utilization, patient safety, and patient satisfaction as the outcomes critical to decision-making. Thus, these are the outcomes for which we conducted

certainty of evidence (COE) ratings. These assessments reflect the degree of confidence we have in our summary findings. We focused on rating the COE for the randomized study designs, since the nonrandomized studies had consistently discordant confidence ratings from the randomized designs. For each outcome of interest, we present the COE by the 3 comparisons of remote triage services: mode of triage delivery (*ie*, telephone, in-person), triage professional type (*eg*, nonclinical call handler, nurse, general practitioner [GP]), and organizational level of triage system (*eg*, national triage systems, local in-practice triage systems). These ratings are summarized below, with supporting information provided in the table.

- We found *moderate* COE to support that remote triage has no effect on ED utilization among the studies comparing 1) in-person and phone modalities and 2) call professional type.
- We found *moderate* COE for no effect on ED utilization among the studies comparing between local in-practice triage and regional/national triage call centers.
- We found *moderate* COE for an *increase* primary care visits among the studies comparing between in-person and phone modalities.
- There is *low* COE that remote triage operated by different call professionals *increases* primary care utilization.
- We found *low* COE to support that remote triage has no effect on primary care visits among the studies comparing between local in-practice triage and regional/national triage call centers.
- There is *low or very low* COE that remote triage has no effect on reducing patient deaths or improving patient satisfaction.
- Of the included studies, only 3 were high-quality, randomized studies that were rated with an overall low ROB that reported each of these outcomes.

### Certainty of Evidence for Primary Outcomes of Effect of Remote Triage

Outcome	Number of Studies (Triage Encounters)	Range of Effects	Certainty of Evidence (Rationale)
<b>Utilization</b>			
ED utilization <b>Mode: telephone vs in-person</b>	2 randomized (21,378)	Range: 0.0 to 0.0 emergency department visits	<b>No effect on emergency department utilization – Moderate certainty</b> (rated down for serious risk of bias)
ED utilization <b>Call professional</b>	2 randomized (35,482)	0.0 fewer emergency department visits; equivalence trial limits: (313 to 489) <sup>a</sup>	<b>No effect on emergency department utilization – Moderate certainty</b> (rated down for serious risk of bias)
ED utilization <b>Organizational Level</b>	1 randomized (4,718)	0.01 (95% CI -0.01 to 0.02) more emergency department visits	<b>No effect on emergency department utilization – Moderate certainty</b> (rated down for serious inconsistency)

Outcome	Number of Studies (Triage Encounters)	Range of Effects	Certainty of Evidence (Rationale)
Primary care utilization <b>Mode: telephone vs in-person</b>	2 randomized (21,378)	Range: 0.20 more to 0.91 more primary care visits	<b>Increase in primary care utilization – Moderate certainty</b> (rated down for serious risk of bias)
Primary care utilization <b>Call professional</b>	1 randomized (20,990)	0.16 (95% CI 0.10 to 0.22) more primary care visits	<b>Increase in primary care utilization – Low certainty</b> (rated down for serious risk of bias and inconsistency)
Primary care utilization <b>Organizational level</b>	2 randomized (6,870)	Range: 2.30 fewer to 0.06 more primary care visits	<b>No effect on primary care utilization – Low certainty</b> (rated down for serious risk of bias and inconsistency)
<b>Patient Safety: Deaths</b>			
<b>Mode: telephone vs in-person</b>	1 randomized (20,990)	Range: 2.08 increase to 5.44 increase in relative risk of death	<b>No effect on deaths – Very low certainty</b> (rated down for serious risk of bias and for imprecision)
<b>Call professional</b>	2 randomized (35,482)	Range: 0.38 fewer to 0.88 fewer deaths	<b>No effect on deaths – Very low certainty</b> (rated down for serious risk of bias and for imprecision)
<b>Patient Satisfaction</b>			
<b>Mode: telephone vs in-person</b>	2 randomized (21,378)	Range: 0.61 lower to 3.94 higher patient satisfaction score	<b>No effect on patient satisfaction – Very low certainty</b> (rated down for very serious risk of bias and serious inconsistency)
<b>Call professional</b>	1 randomized (20,990)	2.61 (95% CI 0.59 to 4.63) higher patient satisfaction score	<b>Decrease in patient satisfaction – Low certainty</b> (rated down for serious risk of bias and inconsistency)
<b>Organizational level</b>	1 randomized (2,152)	8.90 (95% CI -12.08 to -5.72) lower patient satisfaction score	<b>Decrease in patient satisfaction – Very low certainty</b> (rated down for serious risk of bias and inconsistency)

<sup>a</sup> The equivalence limits are shown here for the non-inferiority trial. The number of emergency department admissions in the intervention arm was 414 and fell within the equivalence limits (313 to 489).  
Abbreviations: CI=confidence interval; ED=emergency department; MD=mean difference; NR=not reported; NA=not applicable; RR= relative risk; SMD=standardized mean difference; ROB=risk of bias

## KQ 2

We identified 32 studies that addressed considerations for the planning, execution, and evaluation of remote triage in adults seeking care in a large health system. Seventeen studies were qualitative, 4 were mixed-methods, 1 was an organizational case study, and 4 were systematic reviews. Thematic synthesis of the abstracted data identified 11 themes across all KQ 2 studies that conceptualized consideration for emerging practices that impact the planning,

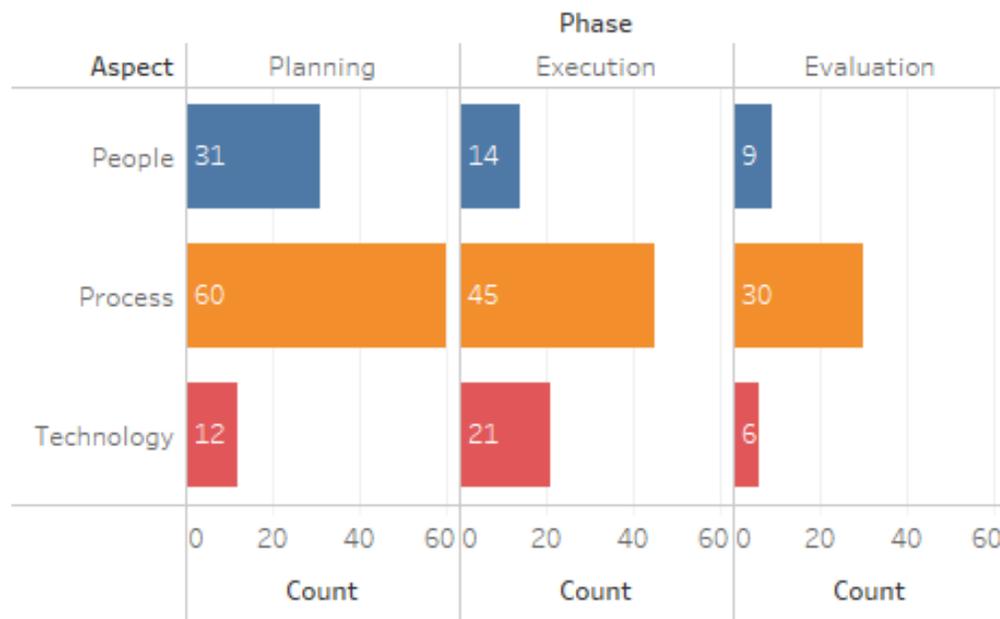
execution, and evaluation of remote triage for adults seeking clinical care advice in a large-scale health system such as the VA.

### Themes of Best Practice Considerations for Remote Triage

Theme	Definition
<b>Training needs</b>	Considerations of any educational requirement to conduct remote triage
<b>Workplace environment</b>	Considerations of the cultural and physical work space on ability to implement remote triage
<b>Skills and knowledge</b>	Ability for the triage provider to ask the right questions to elicit the appropriate information from the patient and use critical thinking to apply the content knowledge to make a clinical decision
<b>Well-being</b>	Considerations to address the physical, emotional, and mental health of the individual doing remote triage work
<b>Workload</b>	Consideration for how the use of remote triage impacts the workload/burden and workflow of providers and others in the clinic setting
<b>Triage system</b>	Considerations of different decision support protocols, remote triage mode, and technologies, or lack thereof, on the ways that triage is implemented
<b>Provider type</b>	Considerations of the interaction of triage provider type (eg, nurse, physician) on the remote triage task
<b>Patient factors</b>	Characteristics of the patient (eg, disease complexity, mental health, disposition) that may impact remote triage
<b>Stakeholders</b>	Considerations pertaining to the involvement of stakeholders in implementing remote triage systems
<b>Cost</b>	Cost considerations pertaining to standing up a remote triage system (eg, staffing, technologies, training, space)
<b>External contextual factors</b>	Local factors that impact the remote triage system, including legal or ethical concerns

Although there were studies that overlapped across these categories, overall, the planning phase contained the greatest studies (n=19), followed by evaluation (n=14), with the execution phase having the fewest number of included studies with relevant findings (n=11). Across aspects of remote triage implementation, the process domain contained the largest (78%) and the technology domain had the smallest (25%) volume of included studies. No studies reported best practices for planning a remote triage system; however, multiple studies reported emerging practices, or consideration for best practices, for planning the implementation of remote triage services in large health care systems. Based on our framework and abstraction scheme, we organized our findings by each of the 11 theme and within each theme, by practice phase (*ie*, planning, execution, evaluation).

### Instances of Themes in Phase and Aspect Categories



Key findings for emerging practices for the implementation of a remote triage system include the following:

- The execution of remote triage influences the entire health care system.
  - At the individual level, considerations must be made for individuals serving as remote triage staff, including a work environment that supports physical and emotional well-being, patients who use triage, and ancillary staff who assist in the daily functioning of triage.
  - At the clinic level, considerations must be made for how remote triage influences the clinic workflow, scheduling and availability of appointments, and workload among clinical and nonclinical call handlers.
  - At the system level, considerations must include how remote triage is influenced by, and also influences, the availability and accessibility of health care services (*ie*, clinic appointments, ambulance services). Attention must be paid to the health care resources in the external environment that impact both remote triage decisions and the patient's ability to adhere to advice.
- Purposeful planning prior to, and throughout the implementation of, remote triage is important in ensuring the success of remote triage.
- Educating patients and their family members on the purpose of remote triage may promote appropriate use of remote triage services.
- Involving call handlers with clinical experience in the planning, execution, and evaluation of remote triage services may facilitate future implementation and use by ensuring that remote triage programs enhance the patient-provider relationship.

- Implementing a remote triage system is perceived as safe, has the potential to reduce medical workload, and can produce a high rate of call resolution. It remains unclear whether a reduction in workload is actual or only a delay in the provision of health care services.

### KQ 3

The 9 comparative studies included in KQ 1 also assessed a broader array of outcomes to evaluate the impact of remote triage. Categories included (1) enhanced access to care; (2) change in rates or trends of services use or change in professionals' workload; (3) adverse events (deaths, emergency department attendance, hospital admissions) and delayed care; (4) clinical outcomes after triage; (5) patient satisfaction measured via Likert scales; and (6) savings from avoided services use and triage costs. This list of metrics was curated from all of the outcomes reported in the literature that meet eligibility for KQ 1. This list demonstrates the various ways that remote triage systems are evaluated beyond the outcomes prioritized by our stakeholders that were evaluated in KQ 1.

## DISCUSSION

### Key Findings

Remote triage modalities offer the potential for improved access to on-demand health care. To assess the true effectiveness of remote triage, we examined the impact of remote triage on outcomes that were meaningful to VHA operations stakeholders, clinicians, and policy makers. Our systematic review is innovative in that it included remote triage by any mode and sought to assess effectiveness of both objective and patient-reported outcomes through inclusion of high-quality designs best suited to evaluate organizational-level interventions. Our systematic review evaluated both qualitative and quantitative studies to address the concept of “best practices” (*ie*, processes that are accepted or proven to be most effective in optimizing positive outcomes) for implementing remote triage systems. We identified 9 comparative studies addressing the effectiveness of remote triage (KQ 1) and metrics used to measure those outcomes (KQ 3), and 32 studies that addressed best practice considerations (KQ 2). No studies specifically addressed Veterans or were conducted in VHA. Similarly, no studies reported modalities of remote triage other than in-person and telephone.

While the literature is complex and heterogeneous, we identified 3 broad categories for the comparisons evaluated in each of the studies: (1) mode of interaction between patient and practitioner (*ie*, telephone vs in-person consultation); (2) triage professional type (*eg*, nonclinical call handler, nurse, GP); and (3) level of triage organization (*eg*, national triage systems, local in-practice triage systems). Although the current evidence is limited and rated as low or moderate certainty of evidence (COE), the majority of included studies did not demonstrate a decrease in primary care (moderate or low COE depending on comparison group) or ED utilization (moderate COE). Further, evidence suggested that local, practice-based telephone triage services have higher case resolution outcomes and refer fewer patients to emergency or primary care services compared with regional/national telephone-based remote triage. Remote triage appears to be safe, but the identified literature was very sparse (very low COE). The impact of remote triage on patient satisfaction was heterogeneous (low or very low COE), and may be influenced by the degree that patients perceive the received triage service to differ from their expectations of care needed at the time of contact (*eg*, the caller expects to receive a same-day appointment rather than after-hours advice from a nonclinical call handler). We also found no difference in overall cost of care, but the literature was very limited. No studies identified best practices but

focused instead on considerations for promising practices when implementing a remote triage system in a large-scale health system such as the VA. These included careful consideration of the physical and emotional workplace and its toll on triage staff, importance of broad stakeholder buy-in prior to implementation, exploration of local context, and testing and refinement of a clinical decision support software/system (CDSS) that maximizes safety and efficiency without undermining clinical judgment.

### **Applicability**

None of the included studies were conducted in VHA or specifically with Veterans. However, we limited the eligibility to studies conducted in OECD countries, which improves applicability to VHA. All comparative studies were conducted in the UK. Further, we limited studies to those conducted in larger health care systems. Across included studies, there were limited data on patient characteristics to compare to the overall VHA population. Yet the findings presented here likely have applicability to any large health care system seeking to implement a remote clinical triage center by telephone.

### **Research Gaps/Future Research**

In brief, research is needed in US populations and with Veterans. There is increasing interest among patients and even health care systems to provide multiple modes of contact; however, the current comparative literature addressed only telephone contact and in-person modalities. Future interventions should focus on modes of remote triage delivery in addition to telephone (*eg*, video, web, mobile applications), the impact of medical record access, the critical elements in support of triage systems, staffing models and experience, and elements of the CDSS that support triage operations. Potential future comparators should include head-to-head comparisons of triage modalities, staffing models, organizational levels, and remote triage features. More research is needed on the outcomes evaluated in this review. Settings for future research include the VA or similar large health care systems.

### **Conclusions**

The US health care system faces several challenges including an aging population, multi-morbid patients, and both a shortage and an uneven distribution of primary care providers across the country. These conditions create a shortfall in access to primary care, pushing some patients to seek care in urgent or ED settings. Remote clinical triage systems have the potential to reduce medical workload, improve access to primary care advice, and reduce inappropriate use of urgent and ED services. Our review provides evidence that the remote triage may be falling short of these goals. We found limited evidence to support that remote triage reduces the burden on primary care utilization or subsequent use of ED services. In fact, we found several studies to support an increase in health care utilization attributable to remote triage. Yet remote triage by telephone at the local in-practice level can produce a higher rate of call resolution when compared to regional or national systems, and appears to be safe in the 2 studies that assessed these outcomes. Although the current evidence is limited and of marginal quality, it remains unclear whether this rate of case resolution results in an actual reduction in use of primary and ED services or only a delay in the provision of services. Last, our study underscores several key considerations for implementing a remote triage system, including the careful consideration of organizational and stakeholder buy-in prior to remote triage launch, physical and psychological workplace environment, staff training and ongoing support, and careful consideration of what

metrics best assess the effectiveness and efficiency of remote triage implementation. Further study is needed to assess the promise of remote triage in optimizing health care outcomes while maintaining patient-reported satisfaction with care.

## ABBREVIATIONS TABLE

AE	Adverse event
AI	Artificial intelligence
CAS	Computerized clinical assessment system
CDSS	Clinical decision support software/system
CeCC	CareEnhance Call Centre software
CI	Confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COE	Certainty of evidence
ED	Emergency department
EPOC	Effective Practice and Organization of Care
ESP	Evidence Synthesis Program
GP	General practitioner
HSR&D	Health Services Research & Development
KQ	Key Question
LPN	Licensed practical nurse
LV	Licensed vocational nurse
MD	Mean difference
MeSH	Medical Subject Heading
MMAT	Mixed Methods Appraisal Tool
NHS	National Health Service
NR	Not reported
OECD	Organization for Economic Cooperation and Development
PACT	Patient-aligned care team
PCP	Primary care physician
PEE	Planning, Execution, Evaluation (phases)
PEI	Patient Enablement Instrument
PICOTS	Population, intervention, comparator, outcome, timing, and setting
PPT	People, Process, Technology (aspects)
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta Analyses
QUERI	Quality Enhancement Research Initiative
SMD	Standardized mean difference
SMS	Short message service
RCT	Randomized controlled trial
ROB	Risk of bias
RR	Relative risk
TEP	Technical Expert Panel
VA	Veterans Affairs
VHA	Veterans Health Administration