Tele-urgent Care for Low-acuity Conditions: 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 comprises 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. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, interface with stakeholders, and address urgent evidence needs. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee composed of health system leadership and researchers. The program solicits nominations for review topics several times a year via the program website.

The present report was developed in response to a request from Department of Emergency Medicine (Specialty Services). The scope was further developed with input from Operational Partners (below), the ESP Coordinating Center, the review team, and the technical expert panel (TEP). The ESP consulted several technical and content experts in designing the research questions and review methodology. In seeking broad expertise and perspectives, divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Ultimately, however, research questions, design, methodologic approaches, and/or conclusions of the review may not necessarily represent the views of individual technical and content experts.

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Operational Partners

Operational partners are system-level stakeholders who help ensure relevance of the review topic to the VA, contribute to the development of and approve final project scope and timeframe for completion, provide feedback on the draft report, and provide consultation on strategies for dissemination of the report to the field and relevant groups.

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Technical Expert Panel

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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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 non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center works to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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WHAT IS TELE-URGENT CARE: A CASE VIGNETTE

A 45-year-old female Veteran with mild intermittent asthma, obesity, and military sexual trauma (MST) contacts her primary care provider with a complaint of wheezing and cough over the last 2-3 days. She calls her VA primary care clinic on a Thursday and speaks with her PACT nurse.

On further questioning, the patient notes that she does not have a fever or COVID exposure. She has a couple of old inhalers at home that she has tried to use which helped "a little." She is mildly short of breath when going upstairs or walking her dog, but able to do everything around the house that she needs to do. According to the nurse triage tool, the patient needs to be evaluated within 48 hours. The PACT nurse checks with the scheduler and notes that the primary care provider's schedule is booked for the day and they do not have any in-person gap visit slots within 48 hours. The patient is counseled on where in her community she can seek in-person urgent care, if needed. Understandably, the patient does not want to make the 90-minute drive to the VA ER as her 7-year-old daughter is home due to a teacher workday; however, she is concerned that it will get worse over the weekend and she won't know what to do.

The PACT RN confers with a provider in the clinic and together they decide to schedule the patient for a tele-urgent care visit via the VA video-connect platform. A video visit is chosen because of the acuity level of the patient's symptoms and the need to minimize exposure to other patients in case she has an infectious illness (*eg*, COVID). Two hours later, the patient completes a video-based visit with a VA provider. The provider is able to watch the patient's breathing and speech pattern during the video visit and determines that she is not in respiratory distress. The patient is able to show the provider her old inhalers and demonstrate her technique. The provider is able to instruct her on which inhaler to use when and demonstrate correct inhaler use techniques.

Over the virtual platform, patient receives instructions on self-care and guidance on when and where she should seek higher-level care or follow up with her primary care provider. The patient does not need to present to the ER over the weekend and slowly improves from her asthma flare. She follows up with her primary care provider the following month for routine management of her chronic condition.

INTRODUCTION

Approximately 1 in 3 emergency department (ED) visits in the United States are non-emergent,[1] potentially leading to unnecessary testing, treatment, and cost. Payers have long struggled to discourage non-emergent ED visits through patient education and higher copayments for ED visits.[1] Delivery systems have built alternatives like same day or after-hours primary care, urgent care centers, and retail clinics.[1-3] One strategy for delivering high quality, cost effective, and easily accessed urgent care is the use of telehealth modalities, or tele-urgent care.[3,4] Tele-urgent care aims to provide unscheduled, on-demand initial treatment of an urgent illness or injury. Such conditions do not require emergency care but may not always be easy to address in a primary care setting.

The coronavirus pandemic affecting the United States in 2020 and beyond has made clear the importance of timely and accessible health care, especially for urgent health needs. Until recently, telehealth care has largely supplemented traditional office or urgent care visits. The COVID-19 pandemic, however, has transformed the health care landscape, as virtual care rapidly became the response to providing medical care while enforcing social distancing, improving health care access, and using resources efficiently.[5] Today, telehealth modalities are a part of the natural experiment of the pandemic, where all health systems have been pushed to re-examine telehealth as a viable strategy that was once hindered by perceptions of cost, access, and quality constraints.[6,7] Indeed, telehealth may create efficiencies in cost and time for health systems as well as access for patients in need of care.[8] Early evidence from the pandemic demonstrated a growing acceptance by health care providers, patients, and health care organizations of virtual care for both routine and urgent care needs.[9-12] Yet telehealth, and particularly virtual visits, are relatively new care options, and evidence related to quality and outcomes is limited. There are also concerns about the effectiveness of telehealth visits and impact on subsequent health care utilization as a result of unresolved symptoms.

The Veterans Health Administration (VHA) is the country's largest integrated health system and, as such, has a mandate to care for Veterans across the entire United States and associated territories. Yet Veterans seeking care for urgent medical conditions may still experience barriers to accessing timely care due to the same challenges faced in civilian health care systems. Effective June 6, 2019, VHA began offering a new urgent care benefit that provides eligible Veterans with greater choice and access to care for the treatment of minor injuries and illnesses in their local communities. A growing subset of these visits have utilized virtual care. The VHA is also currently undergoing a modernization of their Clinical Contact Centers,[13] which will ultimately be available to Veterans 24 hours a day, 7 days a week.[14] Intended as an alternative to ED, urgent care centers, or primary care clinics for many low-acuity conditions, the VHA Clinical Contact Centers will include services like nurse advice, triage, and virtual visits with providers. Veterans Affairs (VA)-wide implementation of Clinical Contact Centers is planned for late 2022 and could have significant implications for Veterans facing temporal and geographic barriers to acute care. The VA Office of Connected Care requested this review to identify the current evidence base and the effect of tele-urgent care for low-acuity, nonemergent conditions on key outcomes such as health care utilization, patient satisfaction, cost, access, and safety. For this report, we define tele-urgent care as health care delivered remotely (*eg*, telephone, video conferencing) that includes medical services intended to provide on-demand initial treatment of an illness or injury that is considered urgent (but is not routine primary care nor emergency care) and that is initiated by a patient with a provider.

In collaboration with VHA operations partners, we developed the following key questions (KQs) for this review:

KQ 1:

A. Among adults, what are the effects of tele-urgent care for low-acuity conditions on key clinical and health system outcomes (*ie*, utilization, patient satisfaction, cost, health care access, case resolution, patient safety)?

B. Do the effects of tele-urgent care for low-acuity conditions differ by (1) provider characteristics (*ie*, specialty, amount of telehealth experience, training) or (2) mode of delivery (*ie*, telephone, video, web, short message service)?

KQ 2:

A. Among adults, what are the adverse effects of tele-urgent care for low-acuity conditions (*ie*, inappropriate treatment, misdiagnosis, delayed diagnosis, patient deaths, provider burnout)?

B. Do the adverse effects of tele-urgent care for low-acuity conditions differ by (1) provider characteristics (*ie*, specialty, amount of telehealth experience, training) or (2) mode of delivery (*ie*, telephone, video, web, short message service)?

METHODS

We followed a standard protocol for this review. Each step was pilot tested to train and calibrate study investigators. The PROSPERO registration number is CRD42020191454. We adhered to the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines.[15]

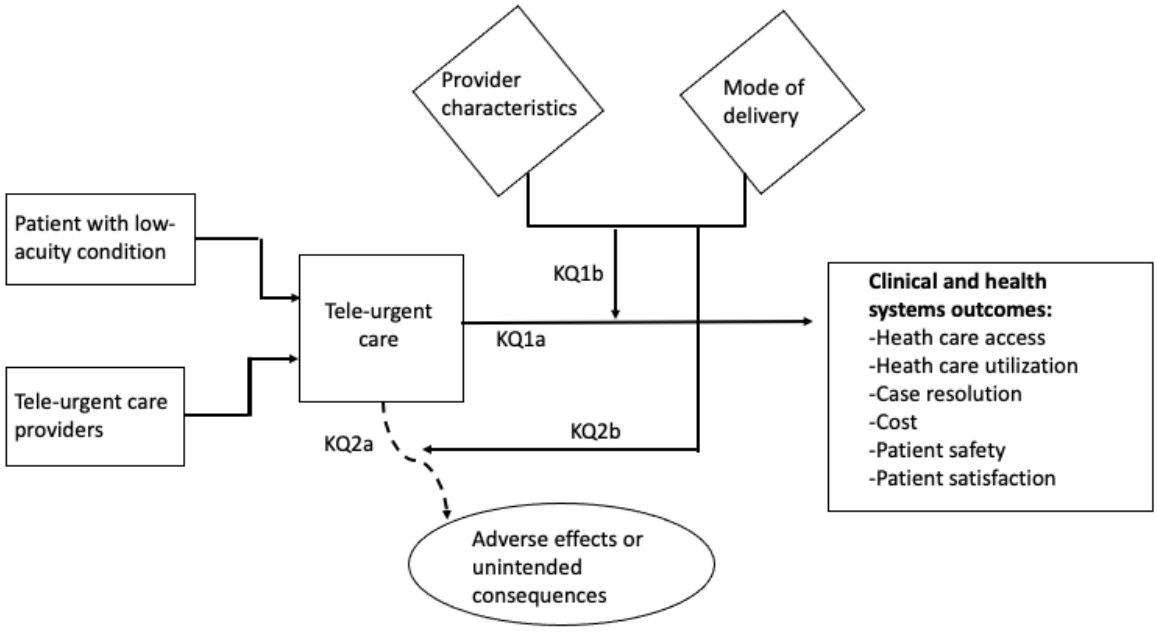
TOPIC DEVELOPMENT

This topic was proposed by a multidisciplinary governance structure led by the Office of Connected Care, which will become part of a larger department-level governance structure overseeing all contact center modernization, including administrative efforts. The results of this study will be relevant to the VHA.

ANALYTIC FRAMEWORK

Prior to the start of our review, we developed an analytic framework (Figure 1) informed by existing research in tele-urgent care and the information needs of VHA operations partners. As depicted in the figure, we sought to explore the impact of tele-urgent care for low-acuity conditions on key clinical and health systems outcomes (KQ 1A) and adverse effects (KQ 2A) prioritized by VHA operations partners. As these effects may be influenced by other factors, we also sought to explore the moderating effects of provider characteristics (*ie*, specialty) and tele-urgent mode (*eg*, video vs telephone) (KQ 1B and KQ 2B).

Figure 1. Analytic Framework



DATA SOURCES AND SEARCHES

We collaborated with an expert reference librarian to conduct a primary search from inception to February 13, 2020, of MEDLINE (via Ovid), Embase (via Elsevier), and CINAHL Complete (via EBSCO). We used a combination of MeSH keywords and selected free-text terms (*eg*, telehealth, urgent care) to search titles and abstracts (Appendix A). We hand searched previous systematic reviews conducted on this or a related topic for potential inclusion.

STUDY SELECTION

Major inclusion criteria for this review were evaluations of tele-urgent care systems for initial care of low-acuity conditions initiated by patients or recommended by a primary care provider. To be considered "tele-urgent care," the service must provide on-demand, unscheduled care for acute conditions with access to a prescribing provider not affiliated with the patient's regular practice. To assist with screening of titles and abstracts, we incorporated the artificial intelligence technology, DistillerAI, developed as part of the DistillerSR software program (Evidence Partners Inc., Manotick, ON, Canada) as the second reviewer on 2,357 references. After most of the references were reviewed by at least 1 reviewer (n= 4,035), using prespecified inclusion/exclusion criteria (Table 1) at the title and abstract level, the DistillerAI program was trained on the database.

The DistillerAI program screened the remaining titles and abstracts and assigned a probability of relevance to the study questions. All citations with ≥ 50% probability of relevance were included to level 2 and underwent full-text review by 2 human reviewers. Articles included by an investigator or the AI algorithm underwent full-text screening. At the full-text screening stage, 2 independent investigators agreed on a final inclusion/exclusion decision. Disagreements between reviewers triggered a discussion between reviewers and involvement of a third reviewer to come to a consensus. Articles meeting eligibility criteria were included for data abstraction.

All results were tracked in both DistillerSR, a web-based data synthesis software program, and EndNote reference management software (Clarivate).

Table 1. Study Eligibility Criteria

Study Characteristic	Inclusion Criteria	Exclusion Criteria
Population	• KQ 1, KQ 2: Adults with low-acuity urgent conditions (≥18 years of age) and their families and caregivers • KQ 2: Tele-urgent care providers (if included in harms)	• Inpatient populations • Simulated patients • Populations in residential facilities that provide regular medical care (*eg*, long-term care, nursing home) • Pediatric-only populations • Mixed populations of adults and children if adults are ≤50% of the population and there is no subgroup analysis by age
Intervention	Tele-urgent care for low-acuity conditions, defined as care delivered remotely (*eg*, telephone, video conferencing) that includes medical services intended to provide on-demand initial treatment of an illness or injury that is considered urgent (but is not routine primary care nor emergency care) and that is initiated by a patient with a provider[a]	• Interventions defined primarily as: o Tele-monitoring o Health coaching o In-person presentations (*eg*, walk-ins to a patient's existing primary care clinic) o Counseling o Longitudinal care management (*ie*, more than 1 contact for an ongoing condition, routine follow-up) o Provider-to-provider communications or consultations beyond the initial transfer of information from a patient-initiated contact o Urgent mental health crisis lines (*eg*, suicide hotlines) o Emergency medical services (*eg*, 911) o Same-day primary care provided by patient's regular primary care provider/practice, including extended hours primary care o Primary care delivered via an alternative modality (*eg*, tele-primary care) • Interventions related only to the use of remote triage for the following: o Specific population or demographic (*eg*, pediatric-only, ethnic minority) o Specific condition (*eg*, depression) medical specialty (*eg*, orthopedics) or ongoing or chronic conditions (*eg*, diabetes) o Technical assessments not related to patient or health care outcomes o General health education
Comparators	• KQ 1:	• KQ 1: No controls

Study Characteristic	Inclusion Criteria	Exclusion Criteria
	○ Usual care/standard of care, waitlist control ○ Other active comparator (*eg*, in-person care • KQ 2: No comparator required	• KQ 2: No exclusion criteria
Outco;esmes	• KQ 1: Patient, provider, system outcomes (*eg*, patient satisfaction, health care access, health care utilization, case resolution, cost, and patient safety) • KQ 2: Key adverse effects associated with telehealth (*eg*, inappropriate treatment, misdiagnosis, delayed diagnosis, patient deaths, provider burnout)	Any outcomes not listed
Timing	Any	Not applicable
Settings	• Outpatient general medical settings (*eg*, primary care, urgent care, emergency departments) • Community settings • Direct-to-consumer commercial business • Hospital-based urgent care	• Intervention delivered primarily in hospital inpatient setting • Mass casualty event • Specialty-specific settings for management of chronic medical conditions
Study design	• KQ 1: EPOC criteria studies[b] that have prospective data collection: ○ randomized trials; nonrandomized trials; controlled before-after studies; and interrupted time-series studies or repeated measures studies ○ prospective and retrospective observational studies (*ie*, cohort studies, case control studies) ○ cross-sectional • KQ 2: Same as for KQ 1 plus the following designs if they address adverse effects: ○ Prospective and retrospective observational studies (*ie*, case-control, cohort) ○ Cross-sectional	• KQ 1, KQ 2: ○ Descriptive studies with no outcomes data ○ Qualitative studies ○ Case reports and case studies ○ Studies that included only outcomes data from one point in time (*eg*, post only, uncontrolled clinical study) ○ Modeling studies that used simulated data • KQ 1: Not a clinical study (*eg*, editorial, nonsystematic review, letter to the editor) ○ Prospective and retrospective observational studies ○ Clinical guidelines ○ Measurement or validation studies • May also exclude the following: ○ Self-described pilot studies without adequate power to assess impact of intervention on outcomes ○ Studies of small sample sizes (n <100)
Language	Any	Not applicable
Countries	OECD[c]	Non-OECD
Publication types	Full publication in a peer-reviewed journal	Letters, editorials, reviews, dissertations, meeting abstracts, protocols without results

Abbreviations. EPOC=Effective Practice and Organisation of Care; OECD=Organization for Economic Cooperation and Development
[a] Relevant conditions include acute or subacute condition or exacerbation of a chronic condition (*eg*, mild asthma exacerbation) that does not constitute a true emergency, and is not for process of care (*eg*, request for a referral, order for routine lab testing, medication refill).
[b] See Cochrane EPOC criteria for definitions and details.[16]
[c] Organization for Economic Cooperation and Development (OECD) includes Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

DATA ABSTRACTION

Data from published reports were abstracted into a customized DistillerSR database by 1 reviewer and overread by a second reviewer. Disagreements were resolved by consensus or by obtaining a third reviewer's opinion when consensus was not reached. Data elements include descriptors to assess applicability, quality elements, intervention details, and outcomes.

Key characteristics abstracted included patient descriptors (*eg*, age, sex, race), intervention characteristics (*eg*, provider type, tele-urgent service modality), comparator, and outcomes, as described previously. Multiple reports from a single study were treated as a single data point, prioritizing results based on the most complete and appropriately analyzed data. Although counted as 1 single study, we cited data from each paper separately. Key features relevant to applicability included the match between the sample and target populations (*eg*, age, Veteran status). For details of study characteristics, see Appendix B. Appendix C presents detailed intervention characteristics. Appendix D lists the excluded studies and reasons for exclusion.

QUALITY ASSESSMENT

Quality assessment was done by the investigator abstracting or evaluating the included article; this initial assessment was overread by a second, highly experienced investigator. Disagreements were resolved by consensus between the investigators or, when needed, by arbitration by a third investigator. For randomized trials, we used the RoB 2 tool.[17] For cross-sectional study designs, we used the NIH risk of bias tool.[18] For non-randomized studies of interventions, we used the ROBINS- I.[19] These criteria included adequacy of randomization and allocation concealment; comparability of groups at baseline; blinding; completeness of follow-up and differential loss to follow-up; whether incomplete data were addressed appropriately; validity of outcome measures; protection against contamination; selective outcomes reporting; and conflict of interest. We assigned a summary ROB score to individual studies.

SYNTHESIS

We summarized the primary literature using relevant data abstracted from the eligible studies. Summary tables describe the key study characteristics of the primary studies: study design, patient demographics, and details of the intervention. We grouped outcomes into similar outcome types (*eg*, outpatient care utilization, emergency department utilization, hospitalization, total cost, index cost), intervention groups (*eg*, comparison by organizational structure of care, comparison by urgent care site) and study design (*eg*, randomized vs nonrandomized). We then determined the feasibility of completing a quantitative synthesis (*ie*, meta-analysis) to estimate summary effects. For meta-analyses, feasibility depends on the volume of relevant literature,

conceptual homogeneity of the studies, and completeness of results reporting. We determined the heterogeneity of the included studies was too high to conduct meta-analysis.

Since quantitative synthesis was not feasible, we narratively analyzed the data. We gave more weight to the evidence from higher quality studies with more precise estimates of effect. The narrative synthesis focuses on documenting and identifying patterns in outcomes efficacy by intervention type across conditions and outcome categories. We analyzed potential reasons for inconsistency in treatment effects across studies by evaluating differences in the study population, intervention, comparator, and outcome definitions.

RATING THE BODY OF EVIDENCE

The certainty of evidence for each KQ was assessed using the approach described by Grading of Recommendations Assessment, Development, and Evaluation (GRADE).[20] We limited GRADE ratings to outcomes identified by the nominating VHA operations partners and Technical Expert Panel as critical to decision-making, which were identified through discussion. In brief, this approach required assessment of 4 domains: study design, risk of bias, consistency, directness, and precision. Additional domains used when appropriate were coherence, dose-response association, impact of plausible residual confounders, strength of association (magnitude of effect), and publication bias. These domains were considered qualitatively, and a summary rating of high, moderate, low, or very low certainty of evidence was assigned after discussion by 2 investigators.

PEER REVIEW

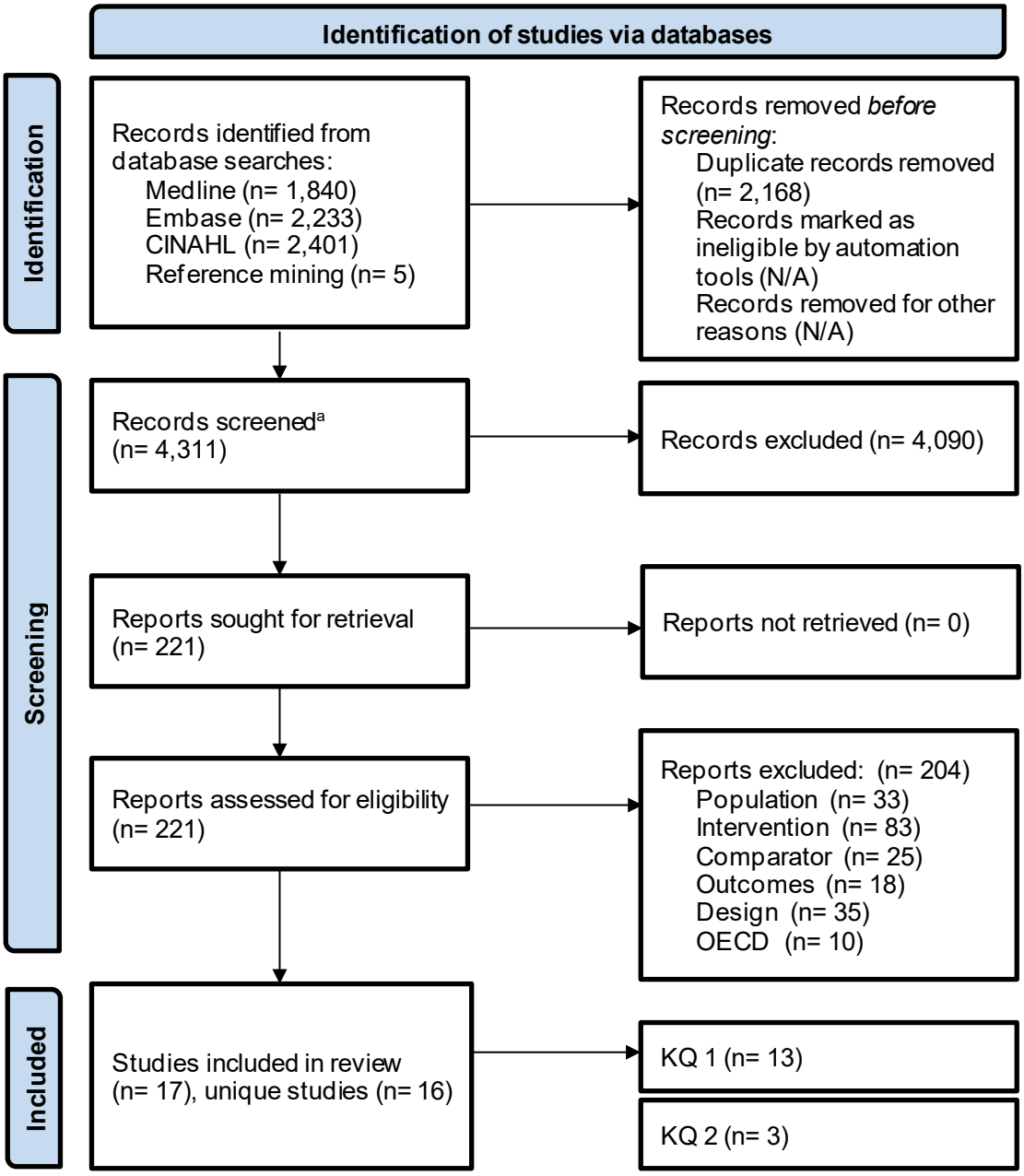
A draft version of this report was reviewed by technical experts and clinical leadership. A transcript of their comments and our responses are in Appendix E.

RESULTS

LITERATURE FLOW

We identified 6,474 studies through searches of MEDLINE (via Ovid), EMBASE, and CINAHL (via EBSCO) (Figure 2). An additional 5 articles were identified through reviewing bibliographies of relevant review articles for a total of 6,479 articles. After removing duplicates, there were 4,311 articles in total. After applying inclusion and exclusion criteria to titles and abstracts, 221 articles remained for full-text review. Of these, 17 studies were retained for data abstraction. Of the 17 studies included, 16 were identified as unique studies. There were 13 unique studies included for KQ 1 and 3 studies for KQ 2. They consisted of 1 randomized controlled trial, 1 cluster-randomized trial, 2 controlled before-after studies, 8 cross-sectionals, and 4 cohorts. Included studies were conducted across North America and Europe (USA, UK, and Ireland). None of the studies were conducted in the VA.

Figure 2. Literature Flowchart



[a] Search results from Medline (1,830), Embase (791), CINAHL (1,685), and manually identified (4) were combined.

EVIDENCE PROFILE

Table 2 shows the evidence profile of studies included in this systematic review.

Table 2. Evidence Profile for Studies of Tele-urgent Care for Low-acuity Conditions

Number of studies: 16 studies
Median number of participants: 8,764 (range 298 to 20.6 million)[a]
Regions: UK (n=9); USA (n=5); Ireland (n=1); Denmark (n=1)
Patient demographics: Median age = 36 years old (14 studies NR); 58% Women (6 studies NR); Race: 86% White, 14% Other (15 studies NR)
Intervention mode[b]: Telephone (n=13); Video (n=4); Internet (n=1); NR (n=1)
Comparisons[b]: In-person care (n=9); Provider type (n=2); NHS 111 (n=2); NA (n=3)
Outcomes reported[b]: Health care utilization (n=6); Patient satisfaction (n=7); Cost (n=4); Case resolution (n=2); Health care access (n=2); Patient safety (n=0); Adverse effects (n=3)
Risk of bias:
RoB 2: Low risk of bias (n=0); Some concerns (n=2); High risk of bias (n=0);
ROBINS-I: Low (n=0); Moderate (n=4); Serious (n=2); Critical (n=0); No information (n=0)
NIH quality assessment tool: Good (n=4); Fair (n=4); Poor (n=0)

Abbreviations. NA= Not applicable; NIH= National Institutes of Health; NHS=National Health System; NR= Not reported
[a] 5 studies reported number of calls or visits with more than 1 encounter possible per person
[b] More than 1 category possible per study

KEY QUESTION 1

A. Among adults, what are the effects of tele-urgent care for low-acuity conditions on key clinical and health system outcomes (*ie*, utilization, patient satisfaction, cost, health care access, case resolution, patient safety)?

B. Do the effects of tele-urgent care for low-acuity conditions differ by (1) provider characteristics (*ie*, specialty, amount of telehealth experience, training) or (2) mode of delivery (*ie*, telephone, video, web, short message service)?

Characteristics of Included Studies

Thirteen studies were included for KQ 1.[3,21-32] Six reported health care utilization,[3,21-23,25,31] 7 reported patient satisfaction,[22,24,26,27,29,30,32] 4 reported cost,[3,21,23,25] 2 reported health care access,[22,27] and 2 reported case resolution. They consisted of 1 RCT,[22] 2 controlled before-after studies,[24,31] 7 cross-sectionals,[23,25,26,28-30,32] and 3 cohorts.[3,21,27] The sample size of studies ranged from 1,115 to 20.6 million with a median of 7,213 participants. The risk of bias (ROB) for the 1 RCT was rated as some concerns.[22] Of the cross-sectional studies, 4 were rated as good[25,26,30,32] and 3 were rated as fair ROB.[23,28,29] Three of the cohort and controlled before and after studies were rated as moderate ROB[21,24,31] and 2 were rated as serious.[3,27]

None of the studies that met KQ 1 eligibility criteria provided analysis by provider characteristics (*ie*, specialty, amount of telehealth experience, training), and studies did not provide sufficient information to conduct study-level subgroup analysis. There were insufficient studies to explore the role of tele-urgent care by mode (*ie*, telephone, video) for any outcome. As a result, we were unable to address KQ 1B.

Effects of Tele-urgent Care on Health Care Utilization: Key Points

- In total, 6 studies assessed the impact of tele-urgent care on health care utilization. Most of these had at least moderate risk of bias (ROB) concerns.
- Results from 2 cohort studies suggest that the introduction of tele-urgent care increased overall health care utilization (*ie*, "new utilization") that may not have been sought and accessed without tele-urgent care options.
- Four studies assessed subsequent health care utilization (*eg*, outpatient visits) after initial consultation from tele-urgent care. These studies were designed to address 2 different comparisons: (1) the impact by organization of the virtual care service and (2) the impact by initial site of care (*eg*, tele-urgent care services vs in-person urgent care clinics).
    - Subsequent outpatient utilization did not significantly differ whether the tele-urgent care was delivered locally or regionally; nor did it differ with different staffing *(eg*, nonclinical call handler, nurse vs general practitioner) for the triage portion of the tele-urgent care interaction.
    - When comparing the initial site of urgent care on subsequent health care utilization, no clear pattern emerged when comparing urgent care initially sought

via virtual modes or other, in-person venues (*eg*, urgent care centers, retail health clinics) outside the ED.

Detailed Findings

We sought to describe the effects of tele-urgent care for low-acuity conditions on subsequent patient care (received for the same condition) and on health care utilization. In total, 4 US-based studies[3,21,23,25] and 2 UK-based studies[31,33] assessed the impact of tele-urgent care on health care utilization. Of these 6 studies, 2 assessed the impact of tele-urgent care on overall patterns in health care utilization,[3,21] 4 assessed outpatient care services,[23,25,31,33] 3 assessed ED utilization,[23,25,31] and 2 assessed inpatient utilization after initial urgent care consultation.[23,25] These studies were designed to address 2 different comparisons: (1) impact by organization of the tele-urgent service (local vs regional systems) and (2) impact by urgent care venue (*eg*, tele-urgent care services vs in-person urgent care clinics). Most studies had some ROB concerns (Figures 3-6).

Next, we organize results by utilization outcome (*eg*, subsequent outpatient visits, subsequent hospitalizations) and then by comparison of interests (organization of tele-urgent care system or urgent care venue).

Effects on Overall Patterns in Health Care Utilization

Two studies explored the impact of introducing tele-urgent care on patterns of health care utilization for low-acuity conditions. One moderate ROB cohort study[21] looked at data from 2011 to 2013 for 981 US state health plan enrollees who had a direct-to-consumer telehealth visit for low-acuity respiratory infections (tele-urgent care condition). These telehealth visits were matched to 1,962 enrollees served only by in-person care for the same condition in the same period of time. This study estimated the in-person care being replaced by tele-urgent care and the care that constituted "new utilization" by comparing the change in in-person physician and ED visits to the change in telehealth visits. By 2013, tele-urgent care accounted for 85 visits per year per 100 people. Of these 85 tele-urgent visits, 11.8% (95% CI -24 to 3) were estimated to be substitutions for care to a physician's office or the ED, and 88.2% (95% CI 60 to 88 visits) were increased utilization (*ie*, "new utilization") attributable to the introduction of tele-urgent care services.

An additional serious ROB cohort study assessed trends from 2008 to 2015 in use of in-person and telehealth acute care venues across 20.6 million visits for low-acuity conditions using claims data from a large US-based commercial health plan.[3] Overall, there was a 140% increase in non-ED urgent visits for low-acuity conditions. Compared with in-person urgent care services, tele-urgent care experienced an overall increase in the proportion of total visits, with low-acuity diagnosis codes from 0 visits in 2008 to 6 visits in 2015 per 1,000 members. In contrast, retail clinic visits (-3.9%) and in-person urgent care center visits (-6.1%) experienced a decrease in the proportion of low-acuity visits—suggesting that much of the overall increase in urgent care may be attributable to the use of tele-urgent care services (Table 3).

Effects on Subsequent Outpatient Care Utilization

Four studies—1 RCT (rated as some concerns for ROB),[22,33] 2 cross-sectional (1 fair ROB[23]; 1 good ROB[25]), and 1 moderate ROB controlled before-and-after study[31]—assessed the impact of tele-urgent care on subsequent use of outpatient care after the initial tele-urgent care visit. Two

studies assessed the impact of 2 different organizational models of telephone-delivered care (local vs national or regional call centers) and found no statistically significant increase in subsequent outpatient care.[31,33] The other 2 studies compared subsequent use of outpatient visits in the 21 days following an index visit between video-based urgent care and in-person urgent care venues.[23,25] Both studies found that urgent care initiated via video had fewer subsequent outpatient visits than urgent care sought in the ED. Yet no clear pattern emerged when comparing video-based and in-person urgent care delivered through non-ED venues.

Comparison by Organizational Structure of Tele-urgent Care

One UK-based RCT (rated as some concerns for ROB) compared after-hours care provided by the patient's own GP practice (n=49 practice physicians) to that provided by commercial external agencies delegated to cover care for GP practices (n=183 external physicians; tele-urgent care condition).[33] After adjusting for age, sex, ethnic group, and access to a car, there were no significant differences in number of visits to primary care in the 2 weeks following tele-urgent care contact (46.5% vs 44.2%, p=0.299). A second study was a moderate ROB controlled before-and-after assessment of the implementation of an updated national health advice line in England staffed by nonclinical call handlers (referred to as "NHS 111") that encompassed 277,163 calls over the 1-year pilot.[31] Prior to the implementation of NHS 111, all areas in England had a 24-hour nurse-led telephone helpline called NHS Direct, which used an initial contact with a nonclinical call handler who then directed calls to a nurse triage staff either during the same call or via a call-back. NHS 111 differed from NHS Direct in that it was managed by nonclinical call handlers who used computerized decision support software (CDSS) to immediately triage incoming calls, avoiding call-backs and wait times, and had the ability to direct callers to the most appropriate service or offer self-management advice. Calls that may involve self-care advice or require referral to specialist services are transferred for clinical advice before a final disposition was reached. NHS 111 resulted in an average monthly increase of 2.5% visits in outpatient care that was not statistically significant (95% CI -3.5 to +8.5).

Comparison by Urgent Care Site: Virtual versus In-person Venues

Two cross-sectional studies (1 good ROB,[25] 1 fair ROB[23]), both conducted in the United States, used similar methods to compare the subsequent use of outpatient visits in the 21 days following an index visit between video-based tele-urgent care and other in-person urgent care venues. The first study was conducted in an integrated health care system, Intermountain Health in Utah.[25] This study compared claims for low-acuity urgent conditions across 1,531 video-based urgent care visits, 2,285 ED visits, 4,377 in-person urgent care center visits, and 4,388 in-person primary care visits. In the 21 days following the index visit, patients initially evaluated via video-based urgent care visits had a statistically significant increase in outpatient visits than those initially evaluated in primary care settings (4% more visits), but fewer primary care visits than those who were seen in the ED (13.2% fewer visits). Compared with video-delivered urgent care, initial care delivered at an in-person urgent care center had similar rates of outpatient visits after the index visit. The second study[23] examined 59,945 on-demand visits for acute conditions (*eg*, colds, allergies, urinary tract infections). The analysis included 4,635 virtual online (*ie*, tele-urgent) and 55,310 non-virtual visits to retail health clinics, in-person urgent care centers, ED, or primary care physicians. The percentage of outpatient follow-up visits within 21 days of the index visit did not have a statistically significant difference between virtual video-delivered urgent care and care delivered via retail health clinics and primary care clinics. Both studies

found that urgent care initiated via video had fewer subsequent outpatient visits than urgent care sought in the ED (Table 3).

Effects on Subsequent Emergency Department Utilization

Three studies—1 moderate ROB controlled before-and-after study[31] and 2 cross-sectional studies (1 good ROB,[25] 1fair ROB[23])—assessed the impact of tele-urgent care on subsequent use of the ED. One study assessed the impact of nationalizing the delivery of tele-urgent care in the year after NHS 111 was piloted and found no statistically significant increase in subsequent ED utilization.[31] The other 2 studies compared subsequent use of the ED in the 21 days following an index visit between video-based tele-urgent care and in-person urgent care venues.[23,25] Again, results were inconsistent when comparing tele-urgent care with non-ED urgent care delivered in-person on subsequent ED use.

Comparison by Organizational Structure of Tele-urgent Care

The moderate ROB controlled before-and-after study (Turner et al, 2019, described above) that assessed the implementation of an updated national health consultation telephone service in England staffed by nonclinical call handlers in NHS 111 found no change in ED utilization in the year after NHS 111.[31] Yet this study did find a statistically significant increase in ambulance services after in implementation of NHS 111 (Table 3.)

Comparison by Urgent Care Site: Virtual versus In-person Venues

The good ROB cross-sectional study conducted in an integrated health care system in the United States (Lovell et al, 2019, described above) compared low-acuity video-based tele-urgent care index visits with index visits originating at the ED, in-person urgent care, or in-person primary care setting.[25] There were no significant differences in follow-up rates of subsequent ED visits between tele-urgent care and both in-person urgent and in-person primary care in the 21 days following the index visit. Yet patients initially evaluated via tele-urgent care had a statistically significant decrease in follow-up visits to the ED compared with those initially evaluated in the ED (7.9% fewer visits). The fair ROB cross-sectional study (Gordon et al, 2017; described above) also found that the urgent care delivered by video consultation resulted in a statistically significant decrease in subsequent ED visits in the 21 days after index visit compared to urgent care initially delivered at the ED (5.3% decrease).[23] This study also found that video-delivered urgent care had fewer subsequent ED visits than low-acuity urgent care initiated in primary care clinics (0.5% decrease) or in-person urgent care (1.4% increase) and similar rates of acute care delivered via retail health clinics.[23]

Effects on Hospitalizations

Comparison by Urgent Care Site: Virtual versus In-person Venues

Two US-based cross-sectional studies (1 good ROB[25] and 1 fair ROB[23]) assessed the impact of urgent care venue on subsequent rates of hospitalization. Both studies found that urgent care delivered by video resulted in a statistically significant decrease in subsequent hospitalizations 21 days after the index visit compared with care delivered at the ED (range 2.2% to 5.2%). Yet no significant differences were reported in the number of hospital stays comparing tele-urgent care with in-person urgent care and in-person primary care in the good ROB study.[25] In comparison, the fair ROB study found that tele-urgent care had a statistically significant decrease

in hospitalizations compared with in-person primary care and in-person urgent care (0.2% fewer visits for both settings) and similar rates for acute care delivered via retail health clinics.[23]

Table 3. Summary of Effects of Tele-urgent Care on Type of Health Care Utilization Pattern

Study	Outcome Description	Results
Overall Patterns in Health Care Utilization		
Poon, 2018[3]	Proportion of total visits with low-acuity diagnosis codes by venue	*Tele-urgent care via video* Percent of visits in 2008: not able to be computed Percent of visits in 2015: 68% *In-person urgent care* Percent of visits in 2008: 71.5% Percent of visits in 2015: 65.4% *Retail clinics* Percent of visits in 2008: 61.8% Percent of visits in 2015: 57.9% *Emergency department* Percent of visits in 2008: 38.4% Percent of visits in 2015: 28.8%
Ashwood, 2017[21]	Substitution of tele-urgent care for in-person health care utilization: decrease in non-telehealth visits to the increase in telehealth visits between telehealth user and nonusers in physician office or emergency department visits for acute respiratory infections (per 100 persons per year)	*Between-group differences in physician office visits or emergency department use between telehealth users and nonusers* -10 visits (95% CI -24 to 3)
	New health care utilization attributable to tele-urgent care: change in total number of telehealth visits and those estimated to be substituting for in-person visits for acute respiratory infections (per 100 persons per year)	*Between-group differences for all sites in physician office visits or emergency department use between telehealth users and nonusers* +74 visits (95% CI 60 to 88)
Outpatient Care Utilization: Comparison by Organizational Structure of Tele-urgent Care		
McKinley, 1997[33]	Percent of patients seen in general practice by doctor or nurse in 2 weeks after out of hours call	*Practice physicians providing tele-urgent care* 46.5% *Tele-urgent care by physicians outside patients' practice* 44.2%

Study	Outcome Description	Results
		p = 0.299
Turner, 2013[31]	Percent change in monthly activity counts for GP out-of-hours, walk-in clinics, minor injury unit, urgent care centers attendance between new telephone-based urgent care (NHS 111) pilot and control sites	*Estimated percent change in monthly activity between tele-urgent care pilot sites and control sites* +2.5% (95% CI -3.5% to 8.5%)
Outpatient Care Utilization: Comparison by Virtual versus In-person Venues		
Lovell, 2019[25]	Percent with outpatient clinic visit within 21 days	*In-person urgent care vs video-based urgent care* 0.92 relative ratio (95% CI 0.83 to 1.01) *Primary care vs video-based urgent care* 0.85 relative ratio (95% CI 0.77 to 0.93) *Emergency department care vs video-based urgent care* 1.50 relative ratio (95% CI 1.35 to 1.64)
Gordon, 2017[23]	Percent of patients with all-cause outpatient visit during 3-week episode post-index visit	*In-person urgent care centers vs video-based urgent care* 25.6% vs 28.1% (p = 0.001) *Primary care physicians vs video-based urgent care* 28.1% vs 28.1% (p = 0.99) *Retail health clinics vs video-based urgent care* 28.6% vs 28.1% (p = 0.51) *Emergency department vs video-based urgent care* 34.2% vs 28.1% (p <0.001)
Emergency Services Utilization: Comparison by Organizational Structure of Tele-urgent Care		
Turner, 2013[31]	Percent change in monthly ED visits in new telephone-based urgent care (NHS 111) pilot sites compared to control sites	*Estimated percent change in monthly activity between pilot sites and control sites* -0.1% (95% CI -3.8% to 3.7%)
	Percent change in monthly utilization of ambulance services (defined as arriving at incident scene) between new telephone-based urgent care (NHS 111) pilot sites compared to control sites	*Estimated percent change in monthly activity between pilot sites and control sites* +2.9% (95% CI 1.0 to 4.8%)
Emergency Department Utilization: Comparison by Virtual versus In-person Venues		
Lovell, 2019[25]	Percent with emergency department visit within 21	*In-person urgent care vs video-based urgent care* 1.29 relative ratio (95% CI 0.75 to 1.83)

Study	Outcome Description	Results
	days by index visit site for urgent care	*Primary care vs video-based urgent care* 1.49 relative ratio (95% CI 0.87 to 2.12) *Emergency department care vs video-based urgent care* 5.53 relative ratio (95% CI 3.34 to 7.71)
Gordon, 2017[23]	Percent of patients with all-cause emergency department visits during 3-week episode post urgent care index visit	*In-person urgent care centers vs video-based urgent care* 2.7% vs 1.3% (p <0.001) *Primary care physicians vs video-based urgent care* 1.8% vs 1.3% (p = 0.02) *Retail health clinics vs video-based urgent care* 1.6% vs 1.3% (p = 0.16) *Emergency departments vs video-based urgent care* 6.5% vs 1.3% (p <0.001)
Hospitalizations: Comparison by Virtual versus In-person Venues		
Lovell, 2019[25]	Percent with inpatient admission within 21 days by index visit site for urgent care	*In-person urgent care vs video-based urgent care* 1.57 relative ratio (95% CI 0.19 to 2.94) *Primary care vs video-based urgent care* 1.77 relative ratio (95% CI 0.22 to 3.32) *Emergency department care vs video-based urgent care* 6.74 relative ratio (95% CI 1.11 to 12.36)
Gordon, 2017[23]	Percent of patients with all-cause inpatient visit during 3-week episode post-index visit	*In-person urgent care centers vs video-based urgent care* *0.4% vs* 0.2% *(p = 0.01)* *Primary care physician vs video-based urgent care* *0.4%* 0.2% vs *(p = 0.02)* *Retail health clinic vs video-based urgent care* 0.3% vs 0.2% (p = 0.12) *Emergency department vs video-based urgent care* 1.0% vs 0.2% (p <0.001)

Effects of Tele-urgent Care on Patient Satisfaction: Key Points

- Seven studies reported on patient satisfaction with tele-urgent care. All 7 were conducted in European medical systems where out-of-hours urgent care is typically provided as part of a broad, integrated system. In such systems, telephone triage could be followed by

telephone consultation for self-care, by a recommendation for an in-person visit to a physician or in-person urgent care center, or by a physician home visit.

- Overall, patients expressed the greatest satisfaction when the care they received matched their expectations for care.
- Differences in patient satisfaction were not consistently observed by triage decision of tele-urgent care interaction (telephone vs clinic visit vs home visit) or by organizational structure of the telephone-delivered care (external physicians vs practice-based and/or cooperative physicians). When differences in satisfaction were observed among triage decision, telephone was found to be associated with lower patient satisfaction compared to in-person care.

Detailed Findings

All 7 studies that evaluated the effects of tele-urgent care on patient satisfaction were conducted in European medical systems where out-of-hours care is typically provided as part of a broad, integrated system.[24,26,27,29,30,32,33] In such systems, telephone care could be followed by telephone consultation for self-care, by a recommendation for an in-person visit to a physician or in-person care center, or by a physician home visit. In this context, 3 studies examined the impact of tele-urgent care triage decision (telephone advice for self-care vs home visit or in-person treatment at a center),[26,30,32] and 4 examined the effects of the organizational structure of telephone-delivered urgent care system (*ie*, local practice-based service vs national or regional "deputizing" call centers)[24,27,29,33] on satisfaction among patients seeking tele-urgent care. Of these 7 studies, 1 was a randomized controlled trial,[33] 1 was a cohort,[27] 1 was a controlled before-and-after study[24], and 4 were cross-sectional studies.[26,29,30,32] Only 1 study had serious ROB concerns.[27] All other studies were assessed as having no serious ROB concerns. Overall, patients expressed the greatest satisfaction when the care they received matched their expectations for care; patients expressed the greatest dissatisfaction when the care they received did not match their expected care. Differences in patient satisfaction were not consistently observed by triage decision of tele-urgent care interaction (*ie*, telephone advice for self-care vs clinic visit vs home visit) or by organization (*ie*, external "deputizing" physicians vs practice-based and/or cooperative physicians). When differences in satisfaction were observed among triage decision, telephone advice was found to be associated with lower patient satisfaction compared with in-person care.

Comparison by Triage Decision of Tele-urgent Care

Two good ROB cross-sectional studies specifically compared dissatisfaction among patients seeking tele-urgent care who were triaged to receive telephone consultation for self-care, visit a clinic, or receive a home visit.[30,32] The first study evaluated patients calling the Glasgow Emergency Medical Service (GEMS).[32] A total of 1,115 patients responded to a survey mailed to every other caller 1 week after contact with the service. Most patients in this study received either a home visit (23%) or visited a clinic (55.9%), while 13.1% received telephone advice only. The authors found that among the variables examined (age, gender, socioeconomic status, perceived difficulty with daytime service, perceived urgency of complaint, match between service expected and service received), patient dissatisfaction was most strongly associated with a disjunct between patients' expectation and the actual triage decision they received. Patients who expected a home visit but received telephone advice expressed the most dissatisfaction with tele-urgent care, followed by those who expected to be invited to attend a center but received telephone advice, and finally by those who expected to receive a home visit but were asked to

attend a center. The second study compared dissatisfaction among 7,213 patients who responded to a postal survey after calling for out-of-hours urgent care in Denmark and being triaged by a physician to receive either a telephone consultation for self-care, a clinic consultation, or a home visit.[30] While the majority of patients reported satisfaction with their experience, patients who received telephone advice for self-care were significantly more likely to report dissatisfaction than those who received either a clinic consultation or a home visit, particularly for those living in urban compared with rural areas.

A third cross-sectional study specifically evaluated whether patient expectations interacted with the care they received to predict satisfaction.[26] Patients requesting out-of-hours care were mailed questionnaires the day after making contact, and 2,263 surveys were returned. A regression model included the type of care (telephone advice, visit to center, or home visit), the type of telephone-based after-hours service (practice-based physician, physician cooperative, or external physician deputizing service), whether or not the service received was the service that was hoped for, and the subscales of the satisfaction scale. Results of the regression indicated that patients who received the type of care they hoped for were likely to report greater satisfaction with tele-urgent care. Also, patients were more satisfied with tele-urgent care from the physician cooperative than the external physician deputizing service. While telephone advice was not significantly different from receiving a home visit in this model, patients who received telephone advice for self-care reported the lowest rate of having received the care they hoped for across types of telephone-based after-hours service (*ie*, practice-based physician, physician cooperative, or external physician deputizing service).

Comparison by Organizational Structure of Tele-urgent Care

Three studies explored the impact of receiving after-hours care from a physician in their own practice compared with those receiving care from GP cooperatives or physicians through commercial external agencies delegated to cover care for GP practices (referred to as "deputizing" service).[27,29,33] The first study was an RCT (rated as some ROB concerns) that evaluated differences in satisfaction between patients in the UK who received care from a physician in their own practice compared with a GP deputizing service. A total of 2,152 patients were interviewed by phone between 24 and 120 hours after contacting the out-of-hours service for care using a questionnaire developed and validated by one of the study authors.[33] Results indicated patients expressed significantly higher satisfaction with practice doctors compared with deputizing service doctors,[33] even though practice doctors were much more likely to give telephone advice than deputizing doctors (20.8% vs 1.5%, respectively).[33]

Two studies assessed the impact of out-of-hours telephone-based urgent care delivered by local practice-based physicians compared to physician cooperatives and/or commercial deputizing physician services. Both found no significant differences in patient satisfaction by organization of tele-urgent care service. The first study was a cohort study with serious ROB considerations. Patients were sent a survey within 7 days of their interaction with either deputizing service or practice-based service.[27] While in bivariate analyses of the 1,555 responses they found that overall satisfaction was higher for physician cooperative than commercial deputizing external physician service, in a multiple regression this variable was no longer significant. Rather, the following variables were each negatively associated with overall satisfaction: receiving telephone advice, having a preference for seeing one's own doctor, and wanting to receive a home visit compared with wanting to attend a center or receive telephone advice. The second

study replicated the methods of the Salisbury et al study, with surveys mailed 1 week after contact to a random sampling of patients seeking out-of-hours care in London stratified by organization of after-hours care (*ie*, local practice-based vs GP cooperative vs deputizing external physician service).[29] Results indicated that satisfaction did not differ between the GP cooperative, the practice-based arrangement, or the commercial deputizing physician service.

One additional study assessed the organization of tele-urgent care on patient satisfaction before and after transition to a new national telephone-based service in the UK (*ie*, NHS 111).[24] This study was a moderate ROB controlled before-and-after study using a validated telephone-administered questionnaire to examine patient satisfaction in pilot and control areas of the UK before and after the transition from NHS Direct to NHS 111. NHS Direct was a 24-hour nurse-led telephone help line that provided 24-hour service and that also handled out-of-hours calls for some general practices. NHS Direct did not have direct access to prescribers or to appointments, though nurses would advise people to call their local physician's out-of-hours service. While most NHS 111 calls are handled by nonclinical call handlers, this service is linked in with the out-of-hours physician practices and can offer telephone consultations by a prescriber, home visits, and face-to-face reviews on site. As such, the transition from NHS Direct could be examined in the context of a transition from a nurse-led advice line to a model that more closely maps to the definition of tele-urgent care. Of the 28,071 respondents, 2,237 reported having used urgent care (NHS Direct/"control" or NHS 111/"pilot") within the prior 3 months and were therefore included in the analyses. Results indicated no significant change in patient satisfaction with tele-urgent care experience before and after transitions to NHS 111.

Table 4 presents a summary of the effects of different aspects of tele-urgent care on patient satisfaction outcomes reported in the included studies.

Table 4. Summary of Effects of Tele-urgent Care on Patient Satisfaction

Study	Comparison	Assessment Scale	Results
Comparison by Triage Decision of Tele-urgent Care			
Tranberg, 2018[30] Cross-sectional N=7213 patients	Satisfaction with telephone consultation vs clinic consultation vs home visit	"Overall satisfaction with the contact" item included in broader questionnaire, with 6 response items: "Very satisfied," "satisfied," "dissatisfied," "very dissatisfied," "neutral," and "don't know"; "neutral" and "don't know" were excluded, and "dissatisfied" and "very dissatisfied" were combined in analysis	• More patients were dissatisfied (p <0.001) with telephone (8.5%) vs clinic consultation (6.0%) or home visit (4.3%) • Dissatisfaction was most strongly associated with "unacceptable wait time"
Wilson, 2001[32] Cross-sectional N=1115 patients	Dissatisfaction for receiving home visit vs attend a center vs telephone advice	Unvalidated 5-point scale of agreement with statement that completely satisfied with type of contact received, from "strongly agree" to "strongly disagree"	• Odds of patient dissatisfaction were most strongly related to expectations and outcome (p <0.0001) • Dissatisfaction was expressed by patients expecting to attend a center but receiving telephone advice (OR 6.43,

Study	Comparison	Assessment Scale	Results
			95% CI 3.35 to 12.32, p <0.0001) • Dissatisfaction was expressed by patients who expected home visit but were asked to attend a center (OR 5.48, 95% CI 3.30 to 9.09, p <0.0001) • Dissatisfaction was expressed by 35% expecting a home visit but receiving telephone advice (OR 10.55, 95% CI 5.70 to 19.53, p <0.0001)
McKinley, 2002[26] Cross-sectional N=2263 patients	Satisfaction with home visit vs attend center vs telephone	Scale developed and validated by McKinley,[34] modified by Salisbury,[27] with 2 additional items added; 5-point scale for overall agreement with statement of satisfaction, with 5 as strongest agreement, 3 as neutral, 2 as strongest disagreement	• Patients who received the type of care they hoped for in terms of service type and consultation type were significantly more satisfied than those who did not, β=230.4, SE(β)=52.8, p <0.0001 • Greater satisfaction was associated with center attendance vs home visits, β=161.4, SE(β)=79.7, p=0.04 • Greater satisfaction was associated with cooperative vs deputizing service, β=272.6, SE(β)=120.1, p=0.02
Comparison by Organizational Structure of Tele-urgent Care			
McKinley, 1997[33] (Companion: Cragg, 1997)[22]	Deputizing service physicians vs practice-based physicians	Patient Satisfaction Questionnaire developed and validated by McKinley[34]: range 0 to 100%, with higher scores reflecting greater satisfaction	Patient satisfaction, mean: 61.8% (95% CI 59.9 to 63.7) deputizing service vs 70.7% (95% CI 68.1 to 73.2) practice doctors p <0.0001

Study	Comparison	Assessment Scale	Results

Salisbury, 1997[27]
Cross-sectional
N=1555 contacts (visits)
	GP cooperative vs deputizing service physicians	Scale developed and validated by McKinley,[34] modified by Salisbury,[27] 5-point scale for overall agreement with statement of satisfaction, with 5 as strongest agreement, 3 as neutral, 2 as strongest disagreement	• Overall satisfaction higher for GP cooperative than deputizing service (mean difference [SE] = -0.12[0.06], *p*=0.041)
			• In multiple regression the variable cooperative vs deputizing service was no longer significant, but the following variables were negatively associated with overall satisfaction:
			  ○ Preference for seeing one's own doctor (mean (SE) regression estimate = −0.461 (0.055), p <0.001)
			  ○ Receiving telephone advice (mean (SE) regression estimate = -0.431(0.069), p <0.001)
			• Wanting to receive a home visit vs to receive telephone advice or attend primary center (mean [SE] regression estimate = -0.489 [0.060] p<0.001)

Shipman, 2000[29]	GP cooperative vs practice-based arrangement vs deputizing service	Scale developed and validated by McKinley,[34] modified by Salisbury,[27] 5-point scale for overall agreement with statement of satisfaction, with 5 as strongest agreement, 3 as neutral, 2 as strongest disagreement	• Mean overall satisfaction scores did not differ between GP cooperative (3.26; 95% CI 3.16 to 3.36) or practice-based arrangement (3030; 95% CI 316 to 3.43) or deputizing service (3.17; 95% CI3.05 to 3.28); p value not reported
Knowles, 2016[24]	Before and after transition to new national telephone-based service in the UK (*ie*, NHS 111)	Validated "Urgent Care System Questionnaire," a 5-point scale for overall satisfaction from "poor or very poor" to "excellent," dichotomized to reflect "excellent" vs all others	Comparison between pilot and control regions of pre-intervention to post-intervention change in proportion of "excellent" rating of urgent care services: OR 0.97 (95% CI 0.69 to 1.37)

Effects of Tele-urgent Care on Health Care Cost: Key Points

- Four studies assessed the cost of delivering tele-urgent care; all were conducted in the United States. All but 1 cross-sectional study was judged to have moderate to serious ROB considerations.

- Across included studies, index costs and total costs for care associated with tele-urgent visits for low-acuity conditions were lower for tele-urgent-type visits compared with similar types of visits for in-person settings (*eg*, ED, in-person urgent care centers). Yet 1 study supports that tele-urgent care may increase overall health care spending via increased access to on-demand care for low-acuity conditions.

- There was variability in how cost was estimated, making it difficult to compare across studies.

Detailed Findings

In total, 4 US-based studies assessed costs for urgent visits for low-acuity conditions by virtual or in-person venues. Three studies assessed the costs of the initial urgent care visit (*ie*, index costs): 2 cross-sectional studies (1 fair ROB[23]; 1 good ROB[25]) and 1 serious ROB cohort study [3]). Three studies also reported on total costs associated with urgent care by virtual or in-person venue: 2 cross-sectional studies (1 fair ROB[23]; 1 good ROB[25]) and 1 moderate ROB cohort study.[21] For this review, index costs are defined as the cost of only the initial tele-urgent care visit, with no additional costs for subsequent care resulting from the visit. Total cost calculations included the index costs plus additional costs from follow-up care such as medications or testing (*eg*, imaging, bloodwork). Overall, with the exception of 1 instance where the total annual spending was moderately increased for tele-urgent care users over nonusers,[21] index costs and total costs across studies were lower for tele-urgent-type visits compared with other settings. Of note, the computed index visit costs for tele-urgent care were similar for all 3 studies: $45,[25] $49,[23] and $39-$40.[3] Total costs across studies by site of urgent care had more variability, likely due to inconsistent inclusion of laboratory, imaging, and pharmacy costs. Yet 1 study demonstrated that net annual health care costs for low-acuity conditions (*ie*, respiratory illnesses) increased $45 per tele-urgent care user compared with nonusers.

Next, we organize studies by index costs and then by total costs. A summary of results is shown in Table 5.

Effects of Tele-urgent Care on Index Cost

A good ROB cross-sectional study examined 59,945 on-demand visits for acute conditions (*eg*, colds, allergies, urinary tract infections).[23] This analysis included 4,635 video-based urgent care visits and 55,310 non-virtual visits. When accounting for the costs of the index visit only, video-based urgent care had a statistically significant lower cost than in-person retail clinic, urgent care centers, primary care clinic, and ED visits. Another fair ROB study, also cross-sectional, included 1,531 claims for video-based visits for low-acuity urgent conditions with 2,285 ED visits, 4,377 in-person urgent care visits, and 4,388 in-person primary care visits.[25] This study also found that index visits for on-demand acute conditions had a statistically significant greater cost at in-person venues compared with video-based urgent care visits. Both studies also reported the largest cost differences between video-based urgent care and ED visits ($1,339 to $1,355 more per visit for the ED).

One additional serious ROB cohort study examined 20.6 million in-person and telehealth acute care visits for treatment of low-acuity conditions at 2 time points, baseline and 8 years' follow-up.[3] This study also reported that the index cost for tele-urgent care was lower than in-person urgent care delivered via the ED, in-person urgent care centers, and retail clinics. Over the 8-year

follow-up, index costs remained relatively stable for in-person urgent care ($165 to $162), retail clinic ($74 to $75), and tele-urgent care ($40 to $39). Yet the price per ED visit for a low-acuity condition increased by 79%, from $914 per visit in 2008 to $1,637 per visit in 2015.

Effects of Tele-urgent Care on Total Cost

A cross-sectional study described above examined 4,635 virtual (*ie*, tele-urgent) and 55,310 non-virtual visits. Retail clinic, urgent care, ED, and primary care provider visit costs were estimated to be $36, $153, $1,735, and $162 (respectively) more costly than virtual tele-urgent care visits in a 3-week episode, inclusive of pharmacy and subsequent medical visit costs.[23] Another cross-sectional study considered costs of 1,531 virtual visits for low-acuity urgent conditions with 2,285 ED visits, 4,377 in-person urgent care visits, and 4,388 in-person primary care visits.[25] The virtual visit average cost ($428) was significantly lower than in-person visits at urgent care ($661), primary care ($706), and ED ($3,403), including laboratory and imaging services, index visit cost, and total cost over a 21-day period.

One moderate ROB cohort study looked at 2012–2013 data for 981 state health plan enrollees who had a telehealth visit for low-acuity respiratory infections (tele-urgent care condition), matching those to 1,962 enrollees served by a different care setting in the same period of time.[21] While telehealth users increased annual spending by $45 (95% CI $10 to $79) compared with nonusers per person, the *total* average spending per episode was less for a telehealth visit ($79) compared with a physician office visit ($146) or an ED visit ($1,734). In this study, total cost included the evaluation and management coding the day of the visit and the evaluation and management coding of follow-up visits plus costs related to pharmacy, imaging, and testing.

Table 5. Summary of Effects of Tele-urgent Care on Health Care Cost

Study	Outcome Description	Results
Index Cost		
Gordon, 2017[23]	Mean index visit cost	*Video-based urgent care* Mean cost: $49 *Retail health clinic* Mean cost: $74 Relative ratio: 1.52 (95% CI 1.49 to 1.54) *In-person urgent care* Mean cost: $134 Relative ratio: 2.75 (95% CI 2.70 to 2.79) *In-person primary care* Mean cost: $109 Relative ratio: 2.25 (95% CI 2.21 to 2.28) *Emergency department* Mean cost: $1404 Relative ratio: 28.87 (95% CI 28.39 to 29.36)

Study	Outcome Description	Results
Lovell, 2019[25]	Mean index visit cost	*Video-based urgent care* Mean cost: $45.0 *In-person urgent care:* Mean cost: $135.7 Relative ratio: 3.01 (95% CI 2.92 to 3.10) *In-person primary care* Mean cost: $114.4 Relative ratio: 2.54 (95% CI 2.46 to 2.62) *Emergency department* Mean cost: $1,383.9 Relative ratio: 30.74 (95% CI 29.67 to 31.81)
Poon, 2018[3]	Inflation-adjusted average prices per index visit (per person per year)	*Tele-urgent care via video* Mean cost in 2008: $40 Mean cost in 2015: $39 *In-person urgent Care* Mean cost in 2008: $165 Mean cost in 2015: $162 *Retail clinics* Mean cost in 2008: $74 Mean cost in 2015: $75 *Emergency department* Mean cost in 2008: $914 Mean cost in 2015: $1,637
Total Cost		
Gordon, 2017[23]	Index visit costs plus any follow-up cost of pharmacy and subsequent medical visit costs during 3-week episode post-index visit	*Video-based urgent care* Mean cost: $339 *In-person urgent care clinic* Mean cost: $492 Relative ratio: 1.45 (95% CI NR) *Retail health clinic* Mean cost: $375 Relative ratio: 1.11 (95% CI NR) *Primary care clinic* Mean cost: $501 Relative ratio: 1.48 (95% CI NR) *Emergency department* Mean cost: $2,074

Study	Outcome Description	Results
		Relative ratio: 6.12 (95% CI NR)
Lovell, 2019[25]	Index cost plus all following medical visits, prescriptions, laboratory tests, and imaging within the 21 days of index visit	*Video-based urgent care* Mean cost: $428.9 *Primary care* Mean cost: $706.6 Relative ratio: 1.65 (95% CI 1.26 to 2.04) *Urgent care* Mean cost: $661.4 Relative ratio: 1.54 (95% CI 1.18 to 1.91) *Emergency department* Mean cost: $3,403.0 Relative ratio: 7.93 (95% CI 5.78 to 10.09)
Ashwood, 2017[21]	Index visit plus evaluation and management coding the day of the visit, the evaluation and management coding follow-up plus costs related to pharmacy, imaging, and testing	*Tele-health users (ie, tele-urgent care)* $79 (95% CI $75 to $86) *Physician office* $146 (95% CI $140 to $150) *Emergency department* $1,734 (95% CI $1,447 to $2,021)

Effects of Tele-urgent Care on Health Care Access: Key Point

- Limited evidence was identified on the effects of tele-urgent care on access to health care. In a single study, patients' satisfaction with the timeliness (*ie*, wait time) for telephone advice did not differ by organizational structure of telephone-delivered urgent care (external "deputizing" physicians vs local cooperative physicians).

Detailed Findings

Timeliness

We aligned our concept of health care access with that of the US Office of Disease Prevention and Health Promotion's Healthy People 2020 objectives[35] and defined access as the ability to provide health care when the need is recognized (*ie*, timeliness) and satisfaction with provider services and communication (*ie*, services). We identified only 1 serious ROB cohort study that reported on timeliness of health care access measured as satisfaction with wait times.[27] This study compared 2 different models of telephone-delivered consultation serving an overlapping area in London, England. Patients were sent a survey within 7 days of their interaction with either a commercial deputizing physician service (*ie*, tele-urgent care) or a local GP cooperative service.[27] In a sub-analysis of patients who only received telephone advice for self-care, satisfaction with wait times for telephone advice did not differ between patients interacting with a GP cooperative physician (n=595) or an external commercial physician service (n=93) (Table 6).

Services

One RCT reported on patient satisfaction with the communication of the GP or the deputizing doctor.[22] Patients were slightly more satisfied with the communication provided by the practice GP, with a mean satisfaction score of 68.9 (95% CI 66.5 to 71.4), compared to the deputizing physician who did not have a prior relationship with the patient, with a mean satisfaction score of 62.9 (95% CI 61.1 to 64.7). However, the p value for the difference in between these groups is significant (p = 0.0002).

Table 6. Summary of Effects of Tele-urgent Care on Health Care Access

Study	Outcome Description	Results
Timeliness		
Salisbury, 1997[27]	Patients' satisfaction with wait time for telephone advice only	*Telephone advice by cooperative physician* Weighted mean score: 3.26 (95% CI 3.10 to 3.42) *Telephone advice by deputizing service* Weighted mean score: 3.29 (95% CI 3.17 to 3.40) Adjusted mean regression estimate 0.08 (SE 0.11) p = 0.457
Services		
Cragg, 1997[22]	Satisfaction with provider communication	*Practice doctors* Mean score 68.9 (95% CI 66.5 to 71.4) *Deputizing doctors* Mean score 62.9 (95% CI 61.1 to 64.7) p = 0.0002

Effects of Tele-urgent Care on Case Resolution: Key Points

- Evidence from 1 study 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 urgent care services.
- Adding additional review of calls to telephone-based urgent care services originally triaged to the ED by either a physician advisor or a non-physician clinical advisor produced more case resolution on the first contact than calls assessed by a non-clinical call handler.

Detailed Findings

Two studies reported on case resolution (*ie*, the health issue or concern was resolved during initial contact with the tele-urgent care system).[22,28] Both studies were conducted in the UK and assessed different ways to organize tele-urgent care. In these studies, people who contacted remote triage services received 1 of 3 possible resolutions to their call: they were triaged to either emergency services, primary care services (including urgent care visits, home visits, or primary

care clinic visits whether after-hours, the same day, or on a future date), or they achieved resolution of their health concern during the initial contact. Table 7 summarizes the results of these studies by these 3 groupings of case resolution status.

The first study, with an overall ROB rating of some concerns, was an RCT and compared a commercial deputized physician group (*ie*, tele-urgent care) versus local practice physicians.[22] Deputizing physicians resolved only 1.4% of calls in the initial contact compared to 20.8% in the practice physician arm. Practice physicians also triaged fewer calls to a home visit (74.9% vs 94.8%) or the ED (0.4% vs 1.3%) than did deputizing doctors.

The next study was a fair ROB interrupted time series study that described the impact of an enhanced clinical assessment service to a national tele-urgent care service (*ie*, NHS 111).[28] During the intervention period, callers who would have been triaged to ED attendance by non-clinical call handlers were immediately transferred to either an emergency physician (*ie*, tele-urgent care condition) or a non-physician clinical advisor (*ie*, nurses or paramedics with a scope of practice that includes assessment, treatment, advice, and diagnosis). Evaluation over the telephone by either of these clinician types reduced the number of callers sent to the ED (75% by physicians or 81% by a non-physician clinical advisor). There was a 22.4% (95% CI 19.0% to 25.7%) difference in the number of cases resolved through on-call advice for self-care between the physician advisors (38.1%) and the non-physician clinical advisor (15.7%). Of the cases resolved by in-person care, physician advisors triaged fewer people to out-of-hours GP clinics but more to the minor injuries units or walk-in centers or in-hours GP clinics than the non-physician clinical advisor).

Table 7. Effects of Tele-urgent Care on Type of Case Resolution

Study	Outcome Description	Results
Telephone advice only		
Cragg, 1996[22]	Resolved during initial contact without referral	*Deputized physician* 15 of 1082 (1.4%) *Practice physician* 216 of 1,037 (20.8%)
Sen, 2019[28]	Received advice of self-care	*Physician* 594 (38.1%) *Non-physician clinical advisor* 165 (15.7%) *Percent difference* 22.4% (95% CI 19.0 to 25.7)
Outpatient care		
Cragg, 1996[22]	Referred to primary care services (*ie*, home visit, GP visit)	*Deputized physician* 1,053 of 1,082 (97.3%) *Practice physician* 817 of 1,037 (78.8%)

Sen, 2019[28]	Referred by GP out of hours	*Physician* 70 (4.5%) *Non-physician clinical advisor* 441 (42.1%) *Percent difference* 37.6% (95% CI 34.3 to 40.8)
	Referred by GP in hours	*Physician* 156 (10.0%) *Non-physician clinical advisor* 7 (0.5%) *Percent difference* 9.5% (95% CI 7.7% to 11.0%)
	Referred to minor injuries unit/walk-in center	*Physician* 225 (14.4%) *Non-physician clinical advisor* 101 (9.6%) *Percent difference* 4.8% (95% CI 2.2% to 7.4%)
Emergency services care		
Cragg, 1996[22]	Referred to emergency services	*Deputized physician* 14 of 1,082 (1.3%) *Practice physician* 4 of 1,037 (0.4%)
Sen, 2019[28]	Referred to ED via ambulance	*Physician* 112 (7.5%) *Non-physician clinical advisor* 100 (9.5%) *Percent difference* 2.0% (% (95% CI to 0.6 to 3.4)
	Referred to ED via own transport	*Physician* 284 (18.2%) *Non-physician clinical advisor* 94 (9.0%) *Percent difference* 9.2% (95% CI 6.6 to 11.9)

Effects of Tele-urgent Care on Patient Safety

No eligible KQ 1 studies reported outcomes related to patient safety.

Quality of Evidence for Key Question 1

ROB assessments for the KQ 1 included studies are summarized in Figures 3-6. The ROB for the single RCT was rated as some concerns due to bias in all factors except selective reporting of results (Figure 3).[22] For the nonrandomized controlled designs, the 2 controlled before-and-after studies were both judged to have issues with potential confounding (Figure 4).[24,31] Of those studies, 1 had an issue with selection of participants and serious concerns for missing data,[24] and the other had additional risk of bias considerations related to outcome measurement and deviations for intended outcomes.[31] For the 3 cohort studies, 1 was rated moderate ROB[21] and 2 were rated serious ROB.[3,27] The moderate ROB cohort study displayed concerns related to confounding and selection of participants.[21] The other 2 serious ROB cohorts[3,27] displayed the following concerns: serious confounding bias (n=2), serious concerns for selection of participants (n=1), serious concerns for missing data (n=1), measurement of outcomes (n=1).[27]

Of the cross-sectional studies, 4 were rated as good ROB[25,26,30,32] and 3 as fair ROB[23,28,29] (Figure 5). Patterns that led to judgments of more concerns for ROB included measurement and adjustment for key confounding variables (n=3), section of subjects from same population (n=1), and at least a 50% participation rate (n=1) (Figure 6).

Figure 3. Risk of Bias Assessment for the Included Cluster-randomized Trial

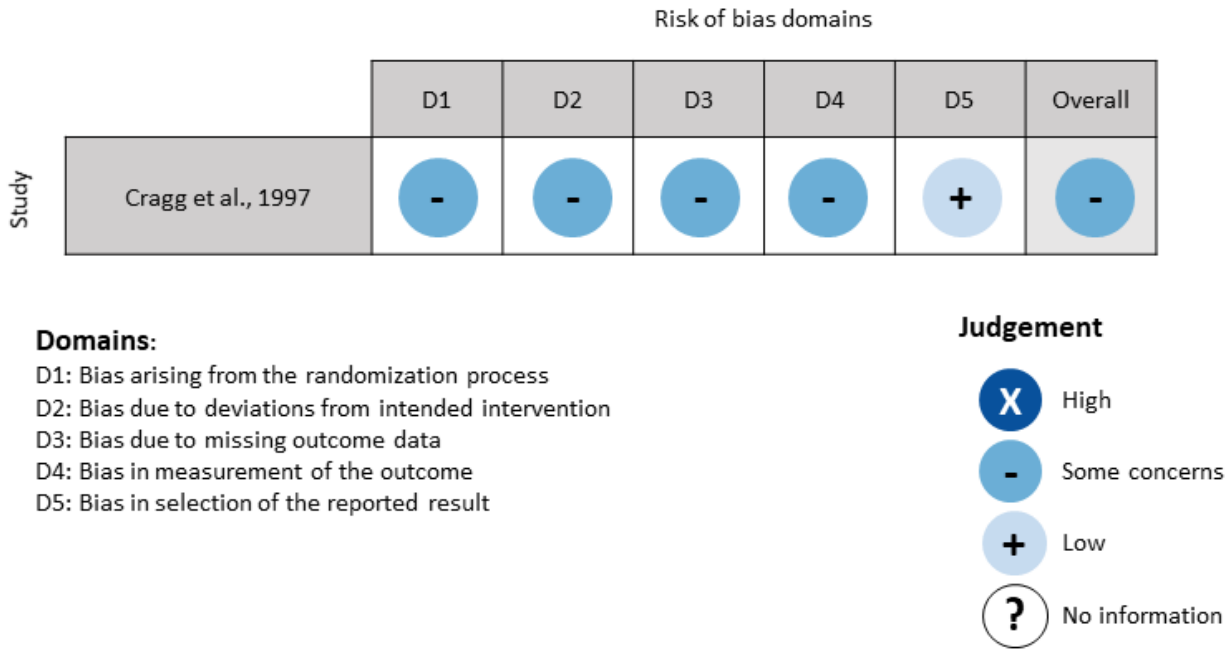
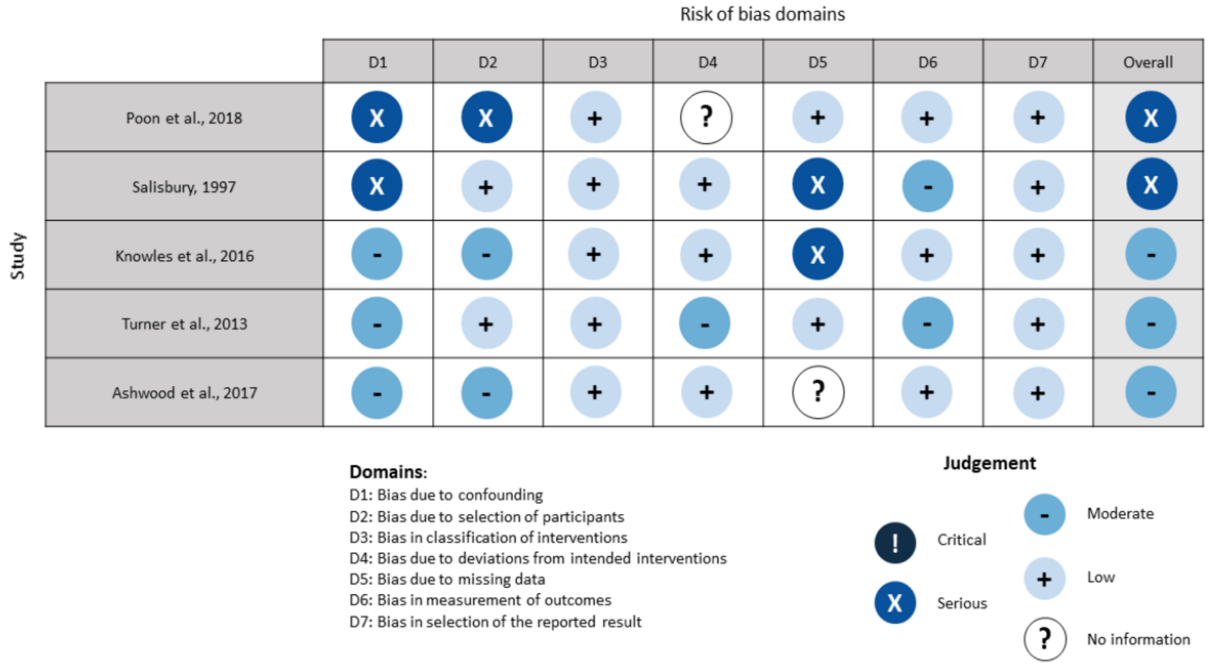


Figure 4. Risk of Bias Assessment for Nonrandomized Studies of Interventions

A



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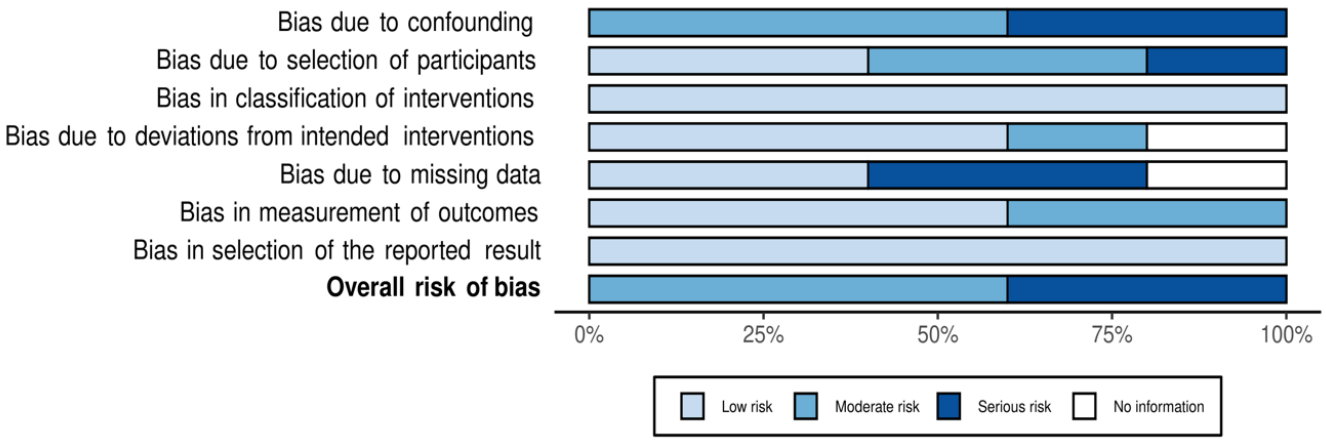
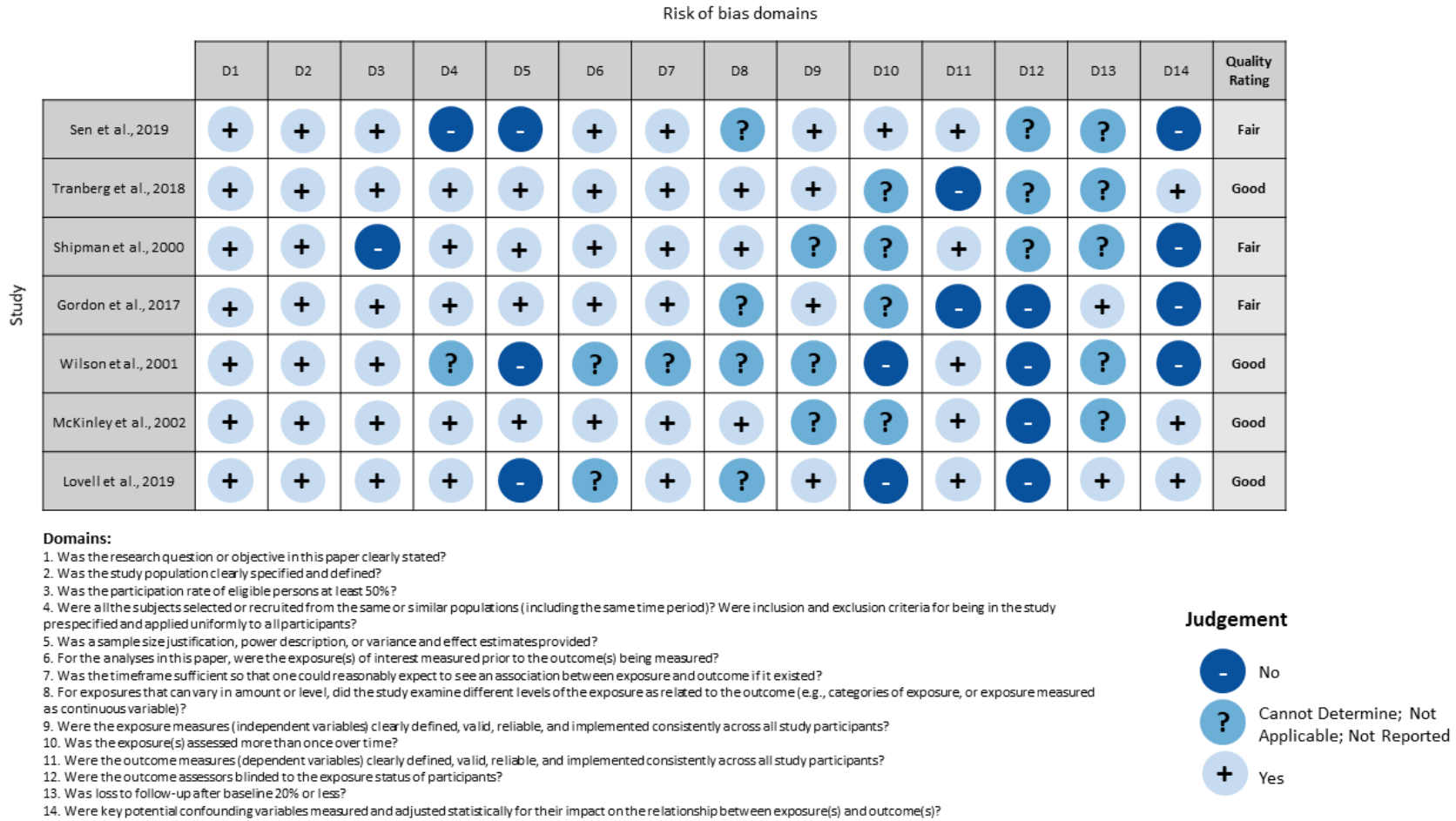


Figure 5. Risk of Bias Assessment for Cross-sectional Studies



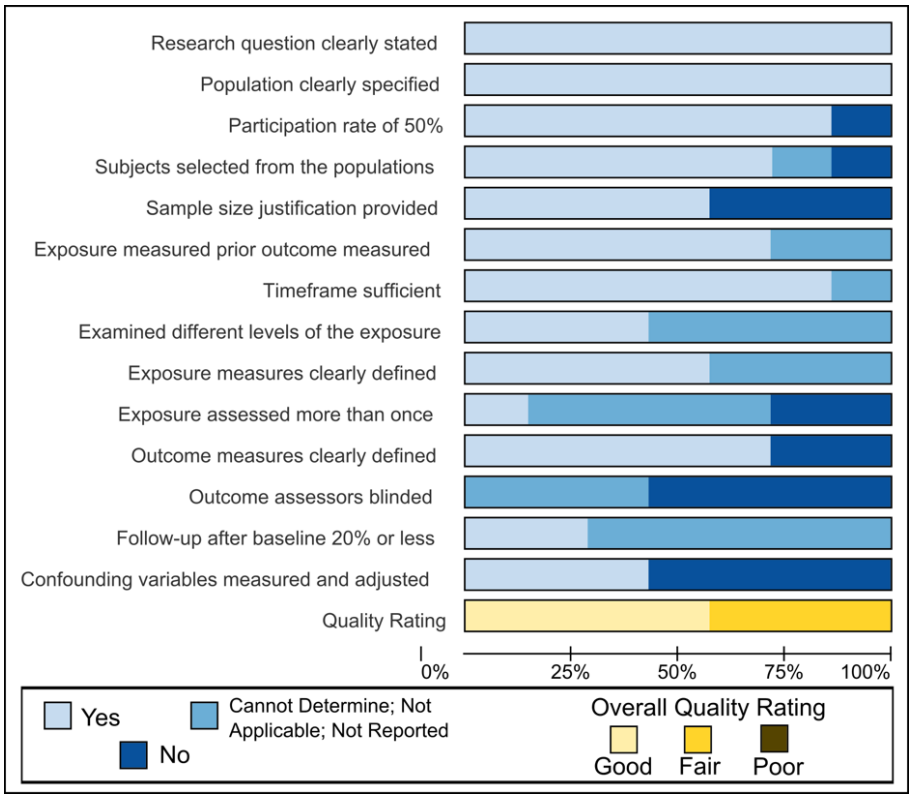
Domains:

1. Was the research question or objective in this paper clearly stated?
2. Was the study population clearly specified and defined?
3. Was the participation rate of eligible persons at least 50%?
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
5. Was a sample size justification, power description, or variance and effect estimates provided?
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
10. Was the exposure(s) assessed more than once over time?
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
12. Were the outcome assessors blinded to the exposure status of participants?
13. Was loss to follow-up after baseline 20% or less?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

Judgement

- \- No
- ? Cannot Determine; Not Applicable; Not Reported
- \+ Yes

Figure 6. Risk of Bias Assessment Across Included Coss-sectional Studies



KEY QUESTION 2

A. Among adults, what are the adverse effects of tele-urgent care for low-acuity conditions (*ie*, inappropriate treatment, misdiagnosis, delayed diagnosis, patient deaths, provider burnout)?

B. Do the adverse effects of tele-urgent care for low-acuity conditions differ by (1) provider characteristics (*ie*, specialty, amount of telehealth experience, training) or (2) mode of delivery (*ie*, telephone, video, web, short message service)?

Characteristics of Included Studies

Three studies were identified that addressed KQ 2.[36-38] Study designs included 1 cluster RCT,[36] 1 cohort,[37] and 1 cross-sectional.[38] The sample size of studies ranged from 298 to 1,167,468 with a median of 14,492 participants. The cluster RCT was rated as moderate ROB,[36] the cohort was rated as fair,[37] and the cross-sectional was rated as some concerns.[38]

Key Points

- Few studies reported the adverse effects of interest. We found no studies that addressed delayed diagnosis or provider burnout. All included studies had ROB concerns.
- One moderate ROB retrospective cohort study found similar or better guideline-concordant antibiotic use for acute upper respiratory infections when treatment was delivered via tele-urgent care compared to in-person primary care or ED visits.
- One fair ROB cross-sectional study reported a small proportion of clinical safety complaints resulting from telephone-based after-hours care, many of which were not validated on objective review.

Detailed Findings

We sought to describe the adverse effects of tele-urgent care for low-acuity conditions, defined as inappropriate treatment, misdiagnosis, delayed diagnosis, and provider burnout. We identified 3 studies that addressed these adverse effects.[36-38] One study was a fair ROB cross-sectional study.[37] Another was a moderate ROB retrospective cohort study.[38] The last study was an RCT rated as having some concerns for ROB and used a comparator arm that mapped to our definition of tele-urgent care.[36] Two studies were conducted in the United Kingdom[36,38] and 1 in the United States.[37] None of the relevant studies for this outcome reported analyses by a priori subgroups of interest (*ie*, provider characteristics, mode of delivery) to address KQ 2B. The types of adverse effects from tele-urgent care that were reported included receipt of inappropriate treatment and misdiagnosis (both objective and patient reported) and adverse clinical outcome (*eg*, deaths). We found no eligible studies that reported on delayed diagnosis or provider burnout as an adverse effect of tele-urgent care.

The first study was an RCT comparing a physician-led to a nurse-led telephone consultation intervention for out-of-hours care among primary care clinics in England.[36] For the purposes of this outcome, only the physician-led condition met our definition of tele-urgent care. In this arm, a practice receptionist took patient details and passed them along to the doctor on call who then provided tele-urgent care. Adverse events of interest included death within 7 days. There were 67 deaths among the patient calls responded to by a general provider (n=7,308).

One retrospective cohort study reported on receipt of inappropriate treatment.[37] Specifically, they compared the quality of antibiotic management in the context of acute respiratory infection between patients receiving care from tele-urgent care visits versus matched patients receiving care via in-person primary care or urgent care visits. Patients were matched based on age, sex, chronic conditions, location, insurance, and diagnostic category. They incorporated data from 39,974 tele-urgent visits, 1,084,056 primary care visits, and 212,837 urgent care visits. Of note, this study was limited to adults between 18 and 64 years of age who had pharmaceutical benefits. The study authors considered inappropriate treatment as a potential adverse effect of tele-urgent care; in the case of acute respiratory infection, this was defined as (1) guideline non-concordant antibiotic use, (2) unnecessary antibiotic use, or (3) no antibiotic use (when they *may* be indicated). Guideline non-concordant antibiotic use was lower among patients treated by tele-urgent compared with primary care (13% vs 15%, $p < 0.001$) or urgent care (13% vs 14%, $p < 0.001$). Unnecessary antibiotic use was the same between tele-urgent and primary care (24% for each) and higher for urgent care (26%, $p < 0.001$). No antibiotic use (when they *may* be

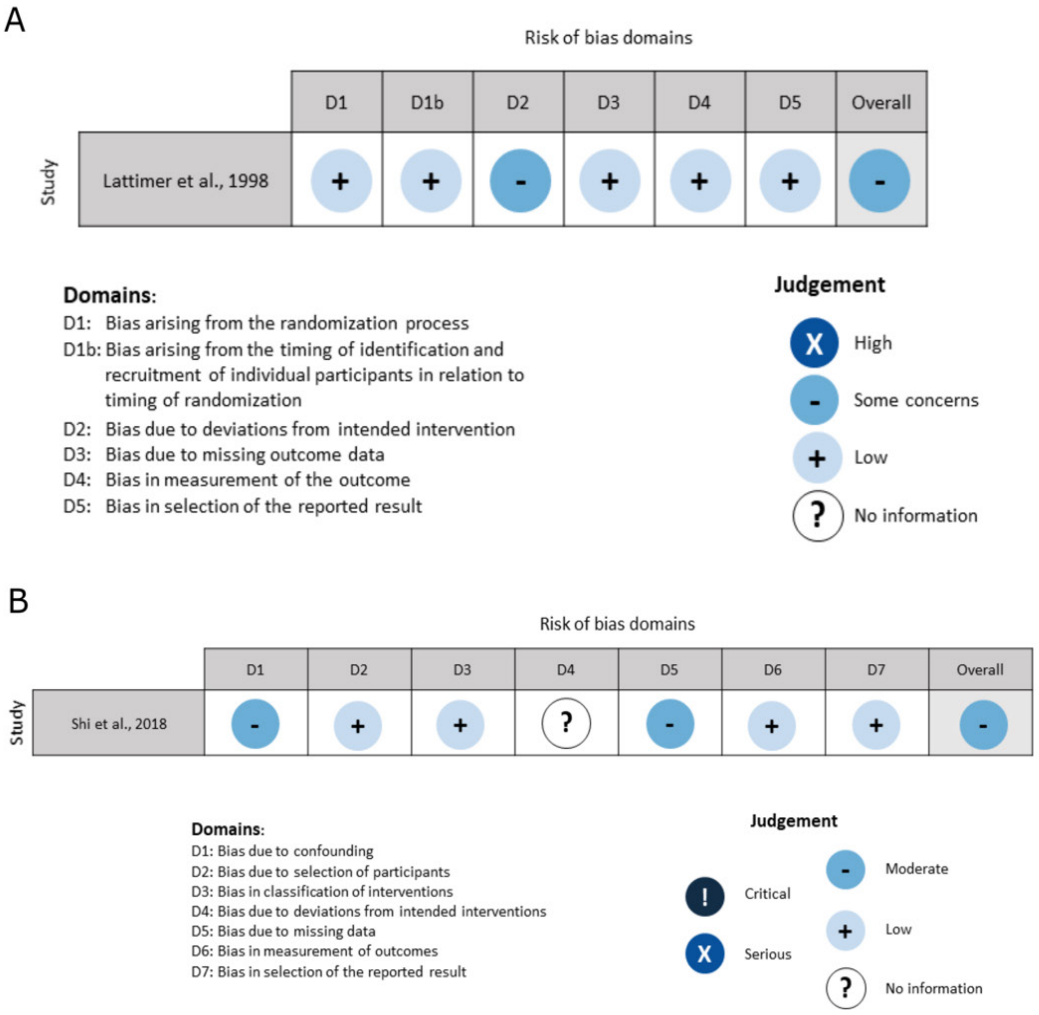
indicated) was higher for tele-urgent than both primary care (17% vs 16%, $p < 0.001$) and urgent care (17% vs 14%, $p < 0.001$).

The last study reported on patient complaints of receipt of inappropriate treatment and misdiagnosis.[38] Study authors conducted a retrospective cohort study (no comparison group) of patient contacts with an out-of-hours service provider in Ireland that included 445,598 telephone contacts. Out of these contacts, 234 patients registered 298 patient service complaints. One hundred twenty-six complaints (42%) were related to clinical care, of which 76 were clinical safety concerns (*eg*, dissatisfaction with physical exam) and 50 were quality-of-care concerns (*eg*, not receiving antibiotics as expected). Authors report that of the 45 complaints about diagnosis, 5 were confirmed as objective misdiagnoses, and 7 of 49 complaints about prescriptions were found to be prescription errors. Level of harm related to these complaints was classified as none/minimal in 102 (81%), minor in 19 (15%), moderate 4 (4%), major in 1 (1%), and catastrophic in 0 cases.

Quality of Evidence for Key Question 2

All studies identified for KQ 2 had ROB concerns (Figure 7). The moderate ROB cluster RCT had concerns related to potential deviations from intended interventions.[36] The cohort, rated as fair, had biases related to potential confounding and missing data.[37] The cross-sectional was rated as some concerns and had issues related to sample size justification, measurement and dose of exposure, and measurement and adjustment for potential confounding variables.[38]

Figure 7. Risk of Bias Assessment Across Included KQ 2 Studies



C

Domains:

1. Was the research question or objective in this paper clearly stated?
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8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
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11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
12. Were the outcome assessors blinded to the exposure status of participants?
13. Was loss to follow-up after baseline 20% or less?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

Judgement

- No
- Cannot Determine; Not Applicable; Not Reported
- Yes

DISCUSSION

The COVID-19 pandemic has underscored the need for timely and accessible health care that fits the level of illness severity. Challenges abound as patients and health care providers alike continue to seek alternative ways to access and deliver appropriate and high-quality urgent care in the context of the current public health crisis. The promise of tele-urgent care is to decrease barriers and improve access to needed low-acuity health care.[39] Also, expanding access to urgent care via virtual modalities may allow more appropriate utilization of scarce and costly in-person emergency department services for high-acuity health conditions.[3,4] Yet there are many unanswered questions about the effects of tele-urgent care on key clinical and health system outcomes. Thus, we sought to evaluate the effectiveness of tele-urgent care (KQ 1A) and adverse effects of tele-urgent care (KQ 2A) and explore differences in these key metrics by provider characteristics and tele-urgent care modality (KQ 1B, KQ 2B). To assess the effectiveness of tele-urgent care, we examined its impact on outcomes meaningful to VHA operations partners and vetted with our panel of technical experts.

Our systematic review is innovative in that it included a definition of "tele-urgent care" that sought to distinguish tele-urgent care systems from other virtual care services that are focused solely on evaluation and triage and do not include treatment by a prescribing provider (*eg*, virtual after-hours advice services, remote triage systems). We also sought to examine both objective and patient-reported outcomes and include a wide variety of experimental and observational designs, including cross-sectional studies. As such, we identified 4 experimental studies (1 RCT, 1 cluster RCT, 2 controlled before-and-after) and 12 observational studies (4 cohorts, 8 cross-sectional). No studies specifically addressed Veterans or were conducted in VHA.

KEY QUESTION 1 SUMMARY

We identified 13 studies that evaluated tele-urgent care across 5 outcomes of interest (*ie*, health care utilization, patient satisfaction, cost, health care access, and case resolution). Six studies

reported health care utilization, 7 reported patient satisfaction, 4 reported cost, 2 reported health care access, 2 reported case resolution, and none reported patient safety. They consisted of 1 RCT, 2 controlled before-and-after studies, 7 cross-sectional studies, and 3 cohort studies. Overall, we found limited evidence on the impact of tele-urgent care on health care access (2 studies), case resolution (2 studies), and patient safety (no studies). None of the studies that met KQ 1 eligibility criteria provided analysis by provider characteristics (*ie*, specialty, amount of telehealth experience, training), and studies did not provide sufficient information to conduct study-level subgroup analysis. There were insufficient studies to explore the role of tele-urgent care by mode (*ie*, telephone, video) for any outcome. As a result, we were unable to address KQ 1B.

Next, we briefly summarize findings on the 3 outcomes prioritized by VHA operations partners as the most important for decision-making. Table 8 summarizes the COE ratings for these 3 outcomes.

Health Care Utilization

Six studies assessed the impact of tele-urgent care on health care utilization. Most had at least moderate ROB. Two studies suggested that the introduction of tele-urgent care may increase overall (*ie*, "new utilization") health care utilization (very low COE). Four studies assessed subsequent health care utilization (*ie*, outpatient visits, ED, inpatient stays) after initial index tele-urgent care with no evidence that subsequent outpatient utilization significantly differs by organizational level of the virtual care (*ie*, local vs regional systems) or by profession of the initial staff conducting the triage portion of the tele-urgent care interaction *(eg*, nonclinical call handler, nurse vs general practitioner). When comparing the initial site of urgent care on subsequent health care utilization, care sought virtually consistently demonstrated lower subsequent health care utilization than care initially sought in the ED. Yet no clear pattern emerged when comparing urgent care initially sought via virtual mode or other, in-person venues (*eg*, urgent care centers, retail health clinics) outside the ED. It is important to note that most studies did not control for condition severity, which likely affects inferences about the impact of tele-urgent care on subsequent health care utilization. The COE for the impact of tele-urgent care on subsequent health care utilization was, at most, rated low.

Patient Satisfaction

Seven studies of varied quality reported on patient satisfaction with tele-urgent care. Differences in patient satisfaction were not consistently observed by triage decision of tele-urgent care interaction (telephone care management for self-care vs clinic visit vs home visit) or by relationship of the care provider to the clinic organization (external "deputizing" physicians vs practice-based and/or cooperative physicians). Generally, patients expressed the greatest satisfaction when the care they received matched their expectations for care. Overall COE for this outcome was rated as low or very low.

Health Care Cost

Four US-based studies assessed the cost of delivering tele-urgent care. All but 1 cross-sectional study were rated as moderate to serious ROB considerations. Across included studies, index costs (low COE) and total costs (very low COE) for care associated with tele-urgent visits for low-acuity conditions were lower for tele-urgent visits compared with in-person urgent care (*eg*,

ED, in-person urgent care centers). Yet 1 study supported that tele-urgent care may increase overall health care spending via increased access to on-demand care for low-acuity conditions.

Certainty of Evidence for Key Outcomes

We conducted COE ratings for the outcomes identified by our stakeholders as critical to decision-making. These assessments reflect the degree of confidence we have in our summary findings. For each outcome of interest, we present the COE by the utilization type (*eg*, overall, outpatient, emergency department), the overall satisfaction with care received by tele-urgent care systems, and the index visit cost and total costs (Table 8).

We identified very low COE that tele-urgent care reduces subsequent ED utilizations. The evidence reporting no effect of tele-urgent care on subsequent outpatient care utilization was low certainty for randomized studies and very low certainty for observational studies. We found very low COE that tele-urgent care systems reduced subsequent hospitalization. The evidence reporting mixed effects of tele-urgent care systems on overall trends in health care utilization was determined to be very low certainty. We have low certainty for randomized studies and very low certainty for observational studies that tele-urgent care has no effect or reduces patient satisfaction. We identified low COE that tele-urgent care reduces index visit costs compared to in-person care. The evidence reporting mixed effects of tele-urgent care on total costs was evaluated to be very low certainty.

Table 8. Certainty of Evidence for Primary Outcomes of Effects of Tele-urgent Care

Outcome	Number of Studies (Patients or Encounters)	Range of Effects	Certainty of Evidence (Rationale)
Utilization			
ED utilization	3 observational (5349,689)	One study reported 0.1% to 5.2% fewer ED visits, 1 study reported RRs between 1.29 (95% CI 0.75 to 1.82) and 5.53 (95% CI 3.34 to 7.71) times less risk for ED visits, and 1 study reported 0.1% decrease in ED use	**Very low certainty** (rated down for serious risk of bias)
Outpatient care	1 randomized (2,152)	2.5% decrease in outpatient visits	**Low certainty** (rated down for serious risk of bias and serious imprecision)
	3 observational (349,689)	One study reported range from 2.5% increase to 6.1% decrease in outpatient visits, 1 study reported a 2.5% (95% CI -3.5% to 8.5%) increase in outpatient visits, and 1 study reported RRs between 0.85 (95% CI 0.77 to 0.93) and 1.50 (95% CI 1.35 to 1.64) times less risk for primary care visits	**Very low certainty** (rated down for very serious inconsistency and serious imprecision)

Outcome	Number of Studies (Patients or Encounters)	Range of Effects	Certainty of Evidence (Rationale)
Hospitalization	2 observational (72,526)	One study reported a range of 0.1% to 0.8% decrease in hospitalization, and 1 study reported RRs between 1.57 and 6.74 times less risk for hospitalization	**Very low certainty** (rated down for serious inconsistency and very serious imprecision)
Overall health care utilization	2 observational (20,602,943)	One study reported a range of 3.9% to 9.6% decrease in other forms of health care utilization, and 1 study reported that 88.2% of the telehealth visits were additional visits attributable to introduction of tele-urgent care	**Very low certainty** (rated down for serious risk of bias and very serious inconsistency and serious imprecision)
Patient Satisfaction			
Total satisfaction	1 randomized (2,152)	61.8% (95% CI 59.9 to 63.7) satisfaction with deputizing service vs 70.7% (95% CI 68.1 to 73.2) satisfaction with practice doctors	**Low certainty** (rated down for serious risk of bias, serious indirectness)
	6 observational (41,505)	One study reported no significant difference between GP cooperatives, practice-based, and deputizing services for out of hours care; 1 study reported a mean difference of -0.12 (p=0.041) between deputizing services and cooperatives; 1 study reported an OR of 0.97 (95% CI 0.69 to 1.37) for excellent patient satisfaction before compared to after NHS 111; 1 study reported higher dissatisfaction (OR 6.43, 95% CI 3.35 to 12.32) when patients expected to receive in-person care but received tele-phone advice; another study reported that there was greater satisfaction associated with cooperative vs deputizing service (p = 0.02); and the last study reported that patients were more dissatisfied with telephone care vs clinic or home visit (p <0.001)	**Very low certainty** (rated down for serious indirectness)
Cost			
Index	2 observational (72,526)	One study reported a range relative decrease in cost between 28.87 (95% CI 28.39 to 29.36) and 1.52 (95% CI 1.49 to 1.54), and another study reported a relative decrease in cost ranging from 2.54 (95% CI 2.46 to 2.62) to 30.74 (95% CI 29.67 to 31.81)	**Low certainty** (rated down for observational study designs)

Outcome	Number of Studies (Patients or Encounters)	Range of Effects	Certainty of Evidence (Rationale)
Total	4 observational (20,675,469)	One study reported a range of $3 decrease to $723 increase in cost compared to $1 decrease in tele-urgent care during the same period. One study reported a range of 1.11 to 6.12 relative decrease in cost. Another study reported an annual spending increase of $45 (95% CI 1.49 to 1.54) per person comparing between tele-urgent users and non-users. The last study reported a relative decrease in cost between 1.54 (95% CI 1.18 to 1.91) and 7.93 (95% CI 5.78 to 10.09)	**Very low certainty** (rated down for serious risk of bias and for serious inconsistency)

KEY QUESTION 2 SUMMARY

We found little evidence on the adverse effects prioritized by VHA operations partners (*ie*, inappropriate treatment, misdiagnosis, delayed diagnosis, provider burnout). We identified only 3 studies in total that met our prespecified eligibility criteria; none addressed provider burnout. All included studies had ROB concerns. One moderate ROB retrospective cohort study explored inappropriate treatment outcomes and found similar or better guideline-concordant antibiotic use for acute upper respiratory infections when treatment was delivered via direct-to-consumer telemedicine compared to in-person primary care or ED visits. For misdiagnosis and delayed diagnosis, one fair ROB cross-sectional study reported a small proportion of clinical safety complaints resulting from telephone-based after-hours care, many of which were not validated on objective review. None of the studies that met KQ 2 eligibility criteria provided analysis by provider characteristics (*ie*, specialty, amount of telehealth experience, training), and studies did not provide sufficient information to conduct study-level subgroup analysis. There were insufficient studies to explore the role of tele-urgent care by mode (*ie*, telephone, video) for any outcome. As a result, we were unable to address KQ 2B.

PRIOR SYSTEMATIC REVIEWS

Most prior systematic reviews on virtual care that were conceptually similar to this topic differed in their focus on initial assessment of acute, undifferentiated, or unscheduled care (*ie*, remote triage), telephone modality only, or non-urgent conditions.[40,41] Six prior reviews focused on similar outcomes but were not able to conduct quantitative synthesis due to high heterogeneity of interventions, outcomes, and designs. One systematic review evaluated patient satisfaction with remote triage but only included telephone-delivered advice.[42] Another sought to include diverse remote triage modalities but only identified those delivered by telephone.[40] These prior reviews reported mixed findings, with 1 review reporting the majority of included studies *did not* demonstrate a decrease in primary care, while another found that most studies demonstrated a decrease in primary care utilization.[42] When comparing the initial site of urgent care on subsequent health care utilization, care sought virtually consistently demonstrated lower subsequent health care utilization than care initially sought in the emergency department. Yet no

clear pattern emerged when comparing tele-urgent care to urgent care sought at in-person venues (*ie*, urgent care centers, retail health clinics, primary care clinics).

For overall patient satisfaction with care, 1 prior review found high levels of satisfaction with virtual care.[43] Two other reviews reported mixed results that are more consistent with our interpretation of the data that patients expressed the greatest satisfaction when the care they received matched their expectations for care (*eg*, receiving in-person care when they expected to receive in-person care).[40,41] For costs, 1 prior review reported that remote triage did not significantly differ in total costs from in-person primary care or by organizational level of the remote triage system (*ie*, local vs national triage system).[40] In contrast, our review found that index costs and total costs for care associated with tele-urgent visits for low-acuity conditions were lower for tele-urgent-type visits compared with similar types of visits for in-person settings (*eg*, ED, in-person urgent care centers). Consistent with our finding, other reviews found little data on safety outcomes and adverse events. Of note, 1 review concluded that the safety and quality of remote triage appeared to be linked to the context of the broader system in which the virtual care system was rooted, including policy priorities, health care costs, demographic and cultural factors, and technical infrastructure.[39] Likely, this applies to tele-urgent care systems as well; we were unable to address this finding in our review.

CLINICAL AND POLICY IMPLICATIONS

Demand for telehealth has been increasing—even before the COVID-19 pandemic. Tele-urgent care, as a subset of services deliverable by virtual approaches at a distance, may be an appropriate means for delivering high-quality care for low-acuity conditions. Given that findings from this review were often from European systems of care, the applicability to the VA system versus other US systems of care is fairly strong. Centralized payment and delivery models found in European countries are most similar to our VA system of care and have lessons for us to learn. There was, however, little cohesion across studies of tasks within care models or standardization in how costs are measured.

Patient satisfaction with tele-urgent care appeared somewhat lower when telephone consultation was a part of tele-urgent care delivery. This suggests that in-person clinic- and home-based care modes may offer the face-to-face experience patients are seeking when reaching out for their urgent care needs. Notably, no included studies were conducted via video visits. Historically, patient satisfaction with video visits has been higher that telephone visits. Video calls may be the answer to optimizing patent satisfaction for virtual visits, but the United States is still hampered by internet broadband challenges in both urban and rural locales, not to mention the personal financial resources needed to purchase devices workable with a video platform. Additionally, video may feel intrusive compared to telephone communication alone. The VA system, if it pivots to long-term tele-urgent care offerings, will need to continue shoring up patients' access by underwriting devices or adding more robust assessments of local broadband to mitigate those challenges.

While the costs of tele-urgent care were not measured uniformly across the included studies, they generally included direct care services plus laboratory, imaging, and pharmacy costs. According to the included studies, virtual visits cost less than other in-person modes of care. However, the introduction of tele-urgent care likely introduces new costs related to staff training, patient preparation for a virtual encounter, technical support, and clinical workflow acclimation.

Delivering care at a distance requires accurate history-taking, adequate assessment with limited means, optimized communication and rapport building, and impeccable professional credentialing. Proactively managing patient expectations of tele-urgent care while compelling staff to follow evidence-based guidelines can improve rates of inappropriate treatment and other adverse outcomes that may be more likely to occur when care is conducted virtually. New systems of care, and providers' initial discomfort with them, could result in higher costs due to using more resources.

Last, patient safety in the tele-urgent care setting is particularly underexplored, with the identified literature providing little guidance. Importantly, 1 included European study had a large sample and examined numerous practice sites and practitioners.[36] A key to that system's success appears to be right-sizing care through a nurse-led triage enhanced by software systems followed by direct hand-off to practitioners for on-call treatment, in-person care, or emergency services. If any health care system in the United States is structured for centralized triage and in-network referral, it is the VA health care system.

LIMITATIONS

Our review has several strengths, including a protocol-driven design, a comprehensive search, inclusion of broad observation and experimental designs, and careful quality assessment via established risk of bias tools. Both our review and the literature, however, have limitations. Overall, the number of identified studies for many outcomes was small, and most of the literature had design limitations that affected study quality. None of the studies that met eligibility criteria provided analysis by provider characteristics (*ie*, specialty, amount of telehealth experience, training), and studies did not provide sufficient information to conduct study-level subgroup analysis. There were insufficient studies to explore the role of tele-urgent care by mode (*ie*, telephone, video) for any outcome. As a result, we were unable to address the differential impact of tele-urgent care by these moderators. Other limitations are detailed below.

Publication Bias

Given the small number of studies, statistical methods to detect publication bias are not useful. Other strategies, such as searching ClinicalTrials.gov for completed but unpublished studies, are not particularly effective ways to identify publication bias.[44] Thus, we did not conduct formal publication bias analysis.

Study Quality

We were also limited by the existing literature. We identified only 4 EPOC designs (2 RCTs and 2 controlled before-and after studies). The majority (n=8) were cross-sectional with many having significant ROB considerations. Inadequate measurement and adjustment for key confounding variables, section of sample; and missingness contributed to judgment of higher ROB across studies.

Heterogeneity

Tele-urgent care is a complex health intervention, which has innate heterogeneity. This review included a wide variety of study designs across key questions. For KQ 1, our review also included 3 different comparisons across outcomes: (1) impact by organization of the tele-urgent service (local vs regional systems), (2) impact by urgent care venue (*eg*, tele-urgent care services

vs in-person urgent care clinics), and triage decision of tele-urgent care (patient satisfaction only). We addressed this heterogeneity by clustering our narrative synthesis by outcome and then by comparison type. We gave more conceptual weight to higher quality designs.

Applicability of Findings to the VA Population

None of the included studies were conducted in VHA or specifically with Veterans. However, we limited eligibility to studies conducted in OECD countries, which improves applicability to VHA. As stated above, many of the included studies were conducted in the United Kingdom, which improves the applicably to the VHA system. All included studies of costs, however, were conducted in the United States. The findings presented here likely have applicability to any large health care system, such as the VHA, seeking to implement tele-urgent care systems.

RESEARCH GAPS/FUTURE RESEARCH

This comprehensive review of the literature identified several gaps in the current evidence that warrant future investigation. We used the framework recommended by Robinson et al to identify gaps in evidence and classify why these gaps exist (Table 9).[45] This approach considers the population, intervention, comparator, outcome, timing, and setting (PICOTS) to identify gaps and classifies them as due to (1) low strength of evidence or imprecise information, (2) biased information, (3) inconsistency or unknown consistency, and (4) not the right information.

Table 9. Evidence Gaps and Future Research

Evidence Gap	Reason	Type of Studies to Consider
Population		
• No studies that actively recruited Veterans	Insufficient information	• RCTs • Quasi-experimental studies • Prospective cohort studies
Interventions		
• How do the effects of tele-urgent care differ by modality (*eg*, telephone vs video)? • What type of type and amount of provider training and experience maximizes quality and minimizes costs? • Is provider oversight sufficient or do providers have to conduct the tele-urgent care consultation? • What impact does access to the electronic medical record have on tele-urgent care? • Does tele-urgent care staff experience (*eg*, years conducting remote triage) matter more than staff type (*eg*, MD or RN)? • How do expectations of tele-urgent care services influence overall patient satisfaction? • What are the most important elements of patient satisfaction with tele-urgent care (*eg*, overall satisfaction, satisfaction with triage decisions)?	Insufficient information	• Comparative effectiveness trials of different types of interventions • Dismantling studies • Longitudinal studies • Qualitative studies

Evidence Gap	Reason	Type of Studies to Consider
Comparators		
• Few head-to-head comparisons of different modalities • No head-to-head comparisons of different staff types by training and level of experience	Insufficient information	• Cluster RCTs • Comparative effectiveness trials
Outcomes		
Limited information on: • Health care utilization • Patient satisfaction • Costs • Health care access • Case resolution • Patient safety • Adverse effects	Insufficient information	• Cluster RCTs • Prospective cohort studies • Nonrandomized controlled before-and-after studies
Setting		
• Limited evidence from US setting, VA Health Care System	Insufficient information	• Cluster RCTs • Hybrid implementation designs • Prospective or retrospective cohort studies • Nonrandomized controlled before-and-after studies

CONCLUSIONS

In early 2020, as telehealth utilization increased, health care providers, patients, and health care organizations rapidly increased their appreciation for care delivered virtually. Rates of patient "no-shows"[46] and travel expenses and travel time decreased,[47] and health care access and scheduling was eased for many, including those with low income.[9] Early in the COVID-19 pandemic, telehealth visits increased 154%,[10] and subsequent data showed substantial decreases in ED visits.[11] Additionally, 76% of patients now view telehealth services favorably, compared to only 11% in 2019, and 58% of health care providers view telehealth more favorably now than before the COVID-19 pandemic.[12]

The promise of tele-urgent care is to improve access to timely health care for low-acuity conditions.[39] Yet there are many unanswered questions about the effects of tele-urgent care on key clinical and health systems outcomes, including costs. Our review provides evidence that tele-urgent care may not significantly increase subsequent utilization of health care services compared to in-person non-ED urgent care. Still, some limited evidence supports that the introduction of tele-urgent care increases overall health care utilization in a system via enhanced access to a convenient source of on-demand care. System leaders need to be attentive to both the intended and unintended consequences of incorporating tele-urgent care in the delivery of health services. Further examination is needed to assess whether and how tele-urgent care can be used to support efforts to attain the quadruple aim[48] of improving the patient care experience, improving the health of a population, reducing per capita health care costs, and improving the

work life of health care providers, including clinicians and staff. As we explore the value of tele-urgent care, it will be critical to weigh potential benefits against both financial costs for the health care system and human costs for increased and varying staffing demands.

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