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Evidence Brief: Effects of Small Hospital Closure on Patient Health Outcomes

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PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) managers and policymakers, as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout VA.

QUERI provides funding for four ESP Centers and each Center has an active VA affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence,
- guide the implementation of 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.

In 2009, the ESP Coordinating Center was created to expand the capacity of QUERI Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

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INTRODUCTION

The Veterans Health Administration (VHA) is assessing alternative strategies for delivering high-quality healthcare to Veterans in areas served by small VA hospitals. To assist in these efforts, the Office of Policy and Planning (OPP) commissioned the VA Evidence-based Synthesis Program (ESP) Coordinating Center to conduct an evidence brief evaluating the size thresholds needed for small general medical/surgical hospitals to maintain safe and high-quality care by comparing small hospitals with larger ones.[1]

Another approach would be to compare the effect on health outcomes and safety of small VHA hospitals to that of alternative resources. In its assessment of the viability of and need for existing small VA hospitals, the VHA plans to take into account the healthcare service capacity of surrounding community resources. The literature on the effects of closing an existing hospital may provide information on important factors to consider in these assessments. Characteristics and location of nearby facilities, and patient clinical and demographic factors may affect the quality of care provided to Veterans in areas with small hospitals that have been closed or that are under consideration for closure. Because the scope of the previous review on hospital size and quality did not include this body of evidence, we recommended a critical review of hospital closure literature to better understand these factors.

Most research on hospital closure concerns either the factors that are associated with the decision to close a hospital, or the effects of hospital closure on measures of access to care such as distance to the nearest healthcare facility. Several factors have been identified as being associated with the decision to close a hospital, most related to financial concerns or inefficiency.[2] Rural hospitals are not found to be more at risk of closure when controlling for these other factors,[3] but the effect of a hospital closure may be greater in a rural community.

Closing small hospitals in rural areas can increase travel time to the nearest facility, while patients in urban areas are less likely to experience increases in travel time after a hospital closure.[4,5] A recent study conducted simulations of closures of nine Japanese hospitals serving patients requiring hemodialysis.[4] Five rural public hospitals and four urban public hospitals were chosen for the model. The total capacity of the urban (324 beds) and rural (319 beds) hospitals was similar. Patients in rural areas had longer commuting times than those in urban areas (median 15 vs. 7 minutes; $P<0.001$). The model simulated the closure of each rural hospital, each urban hospital, all rural hospitals, all urban hospitals, and shifting capacity of the urban hospitals to the rural hospitals. Simulation results showed that if public hospitals in rural areas were closed, the equity of commuting times among patients worsened much more than if urban public hospitals of similar capacity were closed. The equity did not change when capacity of the urban hospitals was shifted to the rural hospitals. Closure of any one of the five rural hospitals increased the number of patients with a longer commuting time, but closure of all four urban hospitals did not affect commuting times. Closing of even the smallest rural facility (total capacity 15) affected equity of commuting times more than closure of the large urban hospitals. In a study of hospital emergency department closures in California, including 785,385 patient records, only a small proportion of patients (10% of the sample) experienced an increase in distance to the nearest emergency department as a result of a hospital closure, and among them, most had less than a one-mile increase.[6] The median increase in distance was 0.8 miles (range

0.1 to 33.4 miles). Another U.S. study looked at the effect of increased driving time to the nearest emergency department over a 10-year period (1995-2005).[5] Patients who experienced the largest increases in driving time were mostly in rural communities. These patients also had more limited access to other hospitals, with the average number of hospitals within a 10-mile radius only 1.03 compared to 2.57 in the control group.

SCOPE

The objective of this evidence brief is to synthesize the literature on the effects of closing an existing small hospital on patient health outcomes. An evidence brief differs from a full systematic review in that the scope of work is more narrowly defined and the traditional review methods are streamlined in order to synthesize evidence within a shortened timeframe.

The ESP Coordinating Center investigators and representatives of the Health Delivery Committee Workgroup worked together to identify the population, intervention, comparators, timing, setting and study design characteristics of interest. The Health Delivery Committee Workgroup approved the following key questions and eligibility criteria to guide this review:

Key Questions

- Key Question 1. What is the impact of closing small hospitals (number of beds <100, average daily census ≤60) on patient health outcomes?
- Key Question 2. How does the impact of small hospital closures vary based on patient characteristics (e.g., age, race/ethnicity, socioeconomic status, health conditions, etc.), geographical location, and the characteristics of the nearest facilities (e.g., distance, size, etc.)?

Inclusion Criteria

- ***P**opulation*: Patients affected by hospital closure
- ***I**nterventions*: Hospital closure
- ***C**omparator*: Any
- ***O**utcomes*: Health outcomes
- ***T**iming*: Any
- ***S**etting*: Any
- ***S**tudy design*: Any

We focused on health outcomes (e.g., health status, rehospitalization, mortality). Studies reporting only intermediate outcomes, such as access to care or changes in healthcare utilization, were not included.

To address Key Question 1, we sought evidence for the direct link between small hospital closure and health outcomes. In Key Question 2, we sought to identify the factors that mediate the relationship between small hospital closures and health outcomes. Potential factors that might influence the impact of the closure of a small hospital on a community or a particular patient include characteristics of the patients, geographic location, and characteristics of nearby facilities.

METHODS

To identify studies about the effect of hospital closure on patient health outcomes, we searched PubMed and MEDLINE (1946-March 2013) using terms for *health facility closure* and *access to healthcare*, supplemented with forward-citation searching of Google Scholar and Scopus using articles identified as most relevant to the key questions (see Supplemental Materials for complete search strategies). Additional citations were identified from reference lists, hand searching, and consultation with content experts. We limited the search to published and indexed articles involving human subjects available in the English language. Study selection was based on the eligibility criteria described above. Titles and abstracts and full-text articles were reviewed by one investigator and checked by another. All disagreements were resolved by consensus.

We used predefined criteria to rate the internal validity of all individual studies. We rated the internal validity (quality) of observational studies as good, fair or poor, using methods of the Drug Effectiveness Review Project (DERP) and based on the adequacy of the patient selection process; completeness of follow-up; adequacy of outcome ascertainment; use of acceptable statistical techniques to minimize potential confounding factors; and whether the duration of follow-up was reasonable to capture investigated events. We abstracted data from all included studies on hospital and patient characteristics and results for each included outcome. All data abstraction and internal validity ratings were first completed by one reviewer and then checked by another. All disagreements were resolved by consensus.

We used a best evidence approach in our synthesis.[1] Controlled studies with a lower risk of bias (those rated good or fair quality) were preferred over uncontrolled studies and those with a high risk of bias (poor quality studies). Studies with repeated measures (time series) were preferred over those with a before-after design.

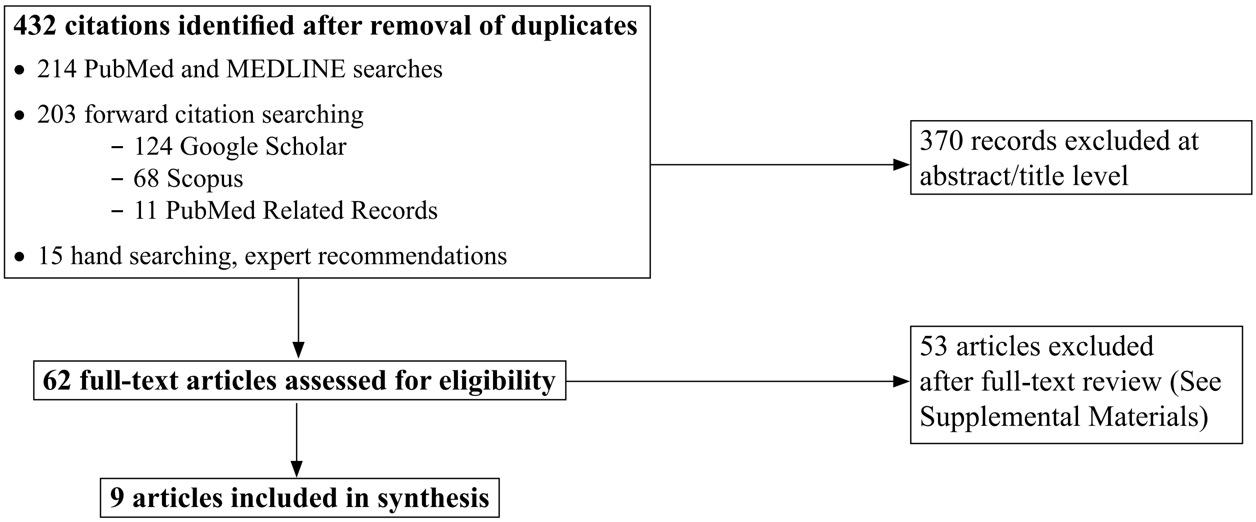
We graded the strength of the evidence based on the guidance established for the Evidence-based Practice Center Program of the Agency for Healthcare Research and Quality. This approach incorporates four key domains: risk of bias (includes study design and aggregate quality), consistency, directness, and precision of the evidence. It also considers other optional domains that may be relevant for some scenarios, such as a dose-response association, plausible confounding that would decrease the observed effect, strength of association (magnitude of effect), and publication bias. Strength of evidence is graded for each key outcome measure and ratings range from high to insufficient, reflecting our confidence that the evidence reflects the true effect.

RESULTS

OVERVIEW

Figure 1 provides details on the results of study selection.

Figure 1. Literature Flow Chart



We included nine observational studies.[3,5-12] Most studies were excluded at the full-text level because they reported only the effect of closure on patients' access to care, or factors associated with a decision to close a hospital, rather than the health outcomes resulting from closure. A full listing of all studies excluded at the full-text level is provided in the Supplemental Materials.

Characteristics of the included studies are shown in Table 1. Four studies were conducted in small hospitals (<100 beds).[3,7,9,12] Studies conducted in small hospitals more directly addressed the key questions, but we also considered evidence from other studies in an attempt to address gaps in the evidence.

Two studies were about the closure of emergency departments. The three other studies concerned closure of hospitals or downsizing that was part of a larger restructuring of the healthcare system in Canada.[8,10,11] In three of the nine studies, the reason for closure was not reported.[3,5,6] Financial difficulties or efforts to contain healthcare costs were given as the reason for closure in the rest. No study reported closure of a hospital because it was underperforming or due to concerns about quality of care. Information on hospital characteristics such as availability of specialty services, membership in a network, and clinical integration factors was not provided in publications, so we were unable to determine how these factors compared in closed versus control hospitals.

Four studies focused on patients with specific health conditions: those undergoing percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass graft (CABG),[11] acute myocardial infarction (MI), hip fracture, or cancer surgery;[8] acute MI, community acquired pneumonia or stroke,[10] or acute MI only.[5] The others included the general population of hospitalized patients or a community in which a hospital closed.[12] In one study,[3] all patients had Medicare, but other characteristics were not reported.

Table 1. Characteristics of included studies

Study design (Quality)	Patient sample size	Closed hospital characteristics	Study design Comparator or control group	Health outcomes
Studies of small hospital closure				
Bindman 1990[7] (Poor for all-cause mortality, fair for other outcomes)	219 in closed hospital county 195 comparison county	1 hospital Semirural California 73 beds	Cohort (survey) Public hospital in a central California county with comparable characteristics	**Self-reported health status** via the Medical Outcomes Study Short Form (MOS-SF): pain, mental health, physical function, health perception, social function, role function. Mortality information from family members and Vital Statistics Registry
Buchmeuller 2006[9] (Poor for all-cause mortality, fair for other outcomes)	23,503	15 hospitals Los Angeles County area # beds range 57-139 (1 NA); mean 88; 5 had >100 beds	Cohort Compared individuals who experienced an increase in distance to the nearest hospital due to a hospital closure to similar individuals in the same region in areas where the availability of hospital services remained constant	**Health status**, mortality, mortality from heart attacks and unintentional injuries sustained at home.
Rosenbach 1995[3] (Poor)	Not reported	12 rural hospitals 6 U.S. states 6 had fewer than 50 beds, only 1 had more than 100 beds All but 1 had an emergency department	Multiple time series; outcomes measured before and at several points after closure No control group	Mortality
Liu 2001[12] (Poor)	Communities had a total population of over 56,000 per year	52 rural hospitals Canada <8 beds	Cohort Compared closure communities to: 1) rural communities that never had a hospital, 2) rural communities that still have a hospital, and 3) the rest of Saskatchewan	**Mortality**: overall, premature, and cause-specific (acute MI, motor vehicle injury, and stroke) Hospital use (number of people hospitalized, not number of discharges) Self-reported health status
Studies of emergency department closure (facility size not reported)				
Hsia 2012[6] (Fair)	785,385 , of which 67,577 experienced an increase in distance to their nearest ED	Nonfederal hospitals in California (emergency departments only)	Cohort Compared patients with an increase in distance to the nearest ED to those who did not	In-hospital mortality

Study design (Quality)	Patient sample size	Closed hospital characteristics	Study design Comparator or control group	Health outcomes
Shen 2012[5] (Fair)	By increase in driving time: None: 1,418,613 <10 minutes: 141,746 10-30 minutes: 26,817 >30 minutes: 3,187	Emergency departments in the U.S.	Cohort Compared people living in zip codes with no increase in driving time to people in zip codes with <10, 10 to 30, or >30 minute increases in driving time	30-day to 1-year mortality rates
Other studies				
Curtis 2005[10] (Fair)	Sample sizes for within vs. outside St. John's (1995-96/1998-99/2000-01): Acute myocardial infarction (AMI): 202/284 vs. 271/274/280 Community acquired pneumonia (CAP): 226/336/264 vs. 108/122/110 Cerebrovascular accident (CVA): 241/274/175 vs. 85/109/116	Newfoundland and Labrador Closed hospitals and aggregated services	Time Series No control group	In-hospital mortality
Hemmelgarn 2001[11] (Poor)	Before closure: 1053 CABG, 2340 PTCA patients After closure: 1529 CABG, 3099 PTCA patients	Large city hospital in Calgary	Before-after After closure, coronary revascularization procedures were amalgamated from 2 facilities into a single facility No control group	For CABG and PTCA, number of discharges per month, burden of comorbidity, length of hospital stay and in-hospital mortality
Brownell 1999[8] (Poor)	Not reported	Winnipeg Downsizing number of acute beds 1991=3042 (N/A) 1992=3013 (29/1.0%) 1993=2707 (306/10.2%) 1994=2498 (209/7.7%) 1995=2460 (38/1.5%) 1996=2380 (80/3.3%)	Before-after No control group	Mortality 30, 60, and 90 days from hospital discharge 30-day readmission

Five studies included a control group of a geographic community with similar characteristics.[5-7,9,12] Four studies used a pre-post design with no concurrent control group;[3,8,10,11] two of these were time series.[3,10] The quality of the studies was fair (5 studies)[5-7,9,10] or poor (4 studies).[3,8,11,12] Details of the quality assessments are shown in the Supplemental Materials. Studies were downgraded to poor quality mainly because they did not control for important confounders such as comorbidities. Other study design flaws leading to downgrading of quality were uncertainty about whether patient selection was unbiased, lack of information about handling of missing data, and lack of blinding of outcome assessment.

KEY QUESTION 1. What is the impact of closing small hospitals (number of beds <100, average daily census ≤60) on patient health outcomes?

Small Hospital Closures

Overall Mortality

Four studies provided evidence about the effect of closure of small hospitals on mortality from any cause (Table 2).[3,7,9,12] All were rated poor quality for this outcome because they only reported crude overall mortality rates, and did not perform analyses to control for confounding. Therefore, their findings may be due to uncontrolled differences in clinical risk factors, comorbidities, or other confounders between the comparison groups. Two studies were conducted in rural or semirural areas in the U.S.,[3,7] one among very small hospitals (<8 beds) in rural areas of Canada,[12] and one in an urban region of the U.S. (Los Angeles County).[9] Overall mortality did not increase significantly in any study. Followup periods ranged from one year to three years after closure; one study did not report the length of followup.[9]

Table 2. Effect of small hospital closure on overall mortality

Author, year (Quality)	Time period	Results (Patients experiencing hospital closure vs. no closure)
Bindman 1990[7] (Poor)	1 year after closure	9/219 (4%) vs. 5/195 (3%) *P*>0.10
Buchmeuller 2006[9] (Poor)	Unclear. Hospitals closed between 1997 and 2003.	Number of deaths overall declined in zip codes experiencing an increase in distance to the nearest hospital. Deaths in zip codes unaffected by closures remained constant. No change: 175 deaths Pre-change: 195 deaths Post-change: 135 deaths
Rosenbach 1995[3] (Poor)	4-year trends (1 year before, during, 1 year after, and 2 years after)	Mortality rate: +4.7% vs. -4.4% Increase, but NS In non-closure area, 4-year mortality trend was 3%
Liu 2001[12] (Poor)	Up to 3 years after closure	Change in mortality per 100,000 people: -48.7 vs. -20.1 Never had a hospital: -33.8 (Largest decrease in mortality was in the areas affected by a closure)
Strength of the evidence: **Insufficient** (high risk of bias, consistent, indirect, imprecise, plausible confounding)		

Cause-specific Mortality

The association of hospital closure with cause-specific mortality was reported in two studies (Table 3); however, one of these was rated poor quality.[12] A fair quality study of hospital closures (most with <100 beds) in the Los Angeles County area found that increased distance to the nearest hospital due to closure of another hospital increased mortality from acute MI and unintentional injuries (time-sensitive conditions), but did not affect mortality from other causes, including chronic heart disease, cancer, COPD, Alzheimer's disease, and diabetes.[9] When the separate effects of distance and closure were examined, the increases in mortality due to distance appeared to be partially offset by closures resulting in patients being transported to higher volume hospitals with more experienced staff. These results should be interpreted with caution, however, as there was not enough variation in the data to distinguish the separate effects of distance and closure.

Table 3. Effect of small hospital closure on cause-specific mortality

Author, year	Cause of death	Results (Patients experiencing hospital closure vs. no closure)
Buchmeuller 2006[9] (Fair)	Acute MI, unintentional injury sustained at home, chronic heart disease, cancer	Increase in mortality for a 1 mile increase in distance to the nearest emergency department due to closure: Acute MI: 6.5%; about 1 additional death per zip code year Unintentional injuries: 11-20%; <0.5 additional deaths per zip code year No increase in deaths from other causes
Liu 2001[12] (Poor)	Acute MI, motor vehicle injury, and stroke	No increases in mortality from acute MI, motor vehicle injury, or stroke (data not reported)
Strength of the evidence: **Low** (medium to high risk of bias, consistency unknown, direct, precise)		

Health Status

Two studies reported the effect of a small hospital's closure on self-reported health status and had conflicting results (Table 4).[7,9] Possible reasons for this discrepancy include differences in their populations, study designs, and characteristics of the closed hospitals and nearby communities. In one study, the community was semi-rural,[7] whereas the other was mainly urban, with alternate sources of care nearby.[9] They differed in the techniques they used to determine if patients were affected by the closure of a hospital. In Shasta County, patients were surveyed specifically to determine their health status following the hospital closure, whereas in the Los Angeles County study, measures of health status were taken as part of an existing health survey. In the Shasta County study, analyses controlled for age, sex, race, work status, insurance status, number of chronic conditions, and baseline response. In the Los Angeles County study, analyses controlled for income, health insurance coverage, health status, neighborhood characteristics such as number of community health clinics in a zip code, and city-level unemployment rates. The Shasta County study found that, regardless of whether they were affected by the closure of a hospital, patients who perceived reduced access to care reported declines in health status. It is possible that a highly publicized hospital closure may have given patients a perception of reduced access to healthcare, leading them to rate their health status more negatively. In Los Angeles County, patients over age 65 perceived increased distance to the nearest hospital to be a larger barrier to care than younger patients, and this group also reported greater declines in health status.

Table 4. Effect of small hospital closure on self-reported health status

Author, year	Patient characteristics	Results (Patients experiencing hospital closure vs. no closure)
Bindman 1990[7] (Fair)	N=219 patients from closed hospital; 195 from comparator hospital Mean age=49 years 38% Male 88% White 32% Medicaid Mean # chronic illnesses: 3.5	MOS-SF: Worse Health Perception (P<0.05), Social Function (P<0.05), Role Function (P<0.05), and Pain (P<0.01) following closure No significant difference in physical function or mental health Perceived changes in health: Worsening of mental health, social function, pain, and health perception
Buchmeuller 2006[9] (Fair)	N=23,503 Mean age=44 years 56% Male 56% White Household income >75,000 US$: 24% 61% Private insured Diabetes: 6% Heart Disease: 6% Mean BMI=24.1	No change in patients' self assessed health (scale 1=excellent, 5=poor) Mean 2.35 pre-change vs. 2.34 after change in distance to the closest hospital. (NS)
Strength of the evidence: **Insufficient** (medium risk of bias, inconsistent, indirect, imprecise)		

Studies of Emergency Department Closures

Two fair quality studies examined the effect on mortality of increased distance or driving time to the nearest emergency department after a hospital closure (Table 5).[5,6] In one, the outcome was in-hospital mortality,[6] and in the other, the mortality rate among patients with acute MI was reported at 7 days, 30 days, 180 days, and 1 year.[5] Neither study reported results by the size of the closed emergency departments, so the applicability of their results to a small hospital closure is unknown.

The first study in Table 5 analyzed the effect of increased distance to the nearest emergency department as a result of a hospital closure on in-hospital mortality in patients with five time-sensitive health conditions.[6] Statewide health and hospital discharge data were analyzed, with a total of 717,808 patients who experienced no change in distance to an emergency department compared to 67,577 patients who did experience an increase in distance. There was no increase in mortality associated with increased distance for the overall group, and no increase in mortality when patients with no increase in distance were compared to those with increases of less than two miles, two to five miles, or over five miles. There were stepwise increases in inpatient mortality, but these increases were not statistically significant. Among patients who had experienced a stroke, those with an increase in distance of over five miles (n=994) had a higher risk of mortality than patients with a decrease in distance or no change. Only a small proportion of patients (10% of the sample) experienced an increase in distance to the nearest emergency department as a result of a hospital closure, and among them, most had less than a one-mile increase. The median increase in distance was 0.8 miles (range 0.1 to 33.4 miles).

A second study looked at the effect of increased driving time to the nearest emergency department over a 10-year period (1995-2005).[5] Mortality rates at 7 days, 30 days, 90 days, 6 months, and 1 year were examined for patients experiencing an acute MI according to whether they had an increase in driving time of less than 10 minutes, 10 to 30 minutes, or over 30 minutes. Patients who experienced the largest increases in driving time were mostly in rural communities. These patients also had more limited access to other hospitals, with the average number of hospitals within a 10-mile radius only 1.03 compared to 2.57 in the control group. Patients with longer commuting times (>30 minutes) had the highest mortality rate.

Table 5. Effect of increased distance to the nearest emergency department on mortality

Study, year	Patient characteristics	Results
Hsia 2012[6] (Fair)	Patients admitted to the hospital in California with acute MI, stroke, asthma, COPD, or sepsis N=67,577 who experienced an increase in distance to the nearest emergency department because of a hospital closure N=717,808 who experienced a decrease or no change in distance	**In-hospital mortality, all-cause** Adjusted OR (95% CI), increase of <2 miles: 1.04 (0.99 to 1.09) Increase of 2-5 miles: 1.03 (0.91 to 1.16) Increase of >5 miles: 1.09 (0.95 to 1.26) For cause-specific in-hospital mortality, only significant increase was for stroke for patients who experienced an increase of >5 miles: 1.22 (1.02 to 1.47)
Strength of the evidence: **Low** (medium risk of bias, consistency unknown, indirect, imprecise)		
Shen 2012[5] (Fair)	Acute MI	**Change in mortality rate at 7 days, 30 days, 180 days, and 1 year** by increased drive time for whole sample: <10 min: -0.0002, 0.0029, 0.0046, 0.0061 (*P*<0.10), 0.0037 10-30 min: -0.0063, -0.0098, -0.0061, -0.0026, -0.0072 >30 min: 0.0172, 0.0123, 0.0258, 0.0449 (*P*<0.10), 0.0565 (*P*<0.05)
Strength of the evidence: **Low** (medium risk of bias, consistency unknown, indirect, imprecise)		

For most outcomes, these studies did not find an increase in mortality due to increases in distance to an emergency department. However, patients with stroke who experienced increases of over five miles, and patients with acute MI who experienced increases of >30 minutes of driving time had higher mortality rates. These studies were conducted in primarily urban areas, where there is a greater availability of alternative sources of care nearby, so even when patients experienced an increase in distance to an emergency department, the increases were relatively small. The closing of hospitals in rural areas may have different effects on patients due to larger increases and longer times for the arrival of emergency service personnel.

Hospital Closures or Downsizing Due to Restructuring of the Healthcare System

We identified three additional studies of hospital closures or downsizing that was part of a larger restructuring of the healthcare system and that reported health outcomes.[8,10,11] None found an association between restructuring and poorer health outcomes, including inpatient mortality,[10,11] mortality at 30, 60, or 90 days post-discharge,[8] hospital length of stay in patients undergoing CABG or PTCA,[11] or 30-day readmission rates.[8] Although they met our inclusion criteria, they did not provide useful evidence to address the key questions because they looked at a broader restructuring of healthcare services, of which closure of hospitals or beds within a hospital was just one aspect. Their quality was poor[8,11] or fair.[10] All used a pre-post design with no concurrent control group, so it is not possible to determine causality from their results. One was better quality because it used a time series design, but there was no control for confounding factors in the analysis. Additionally, results of these studies are not likely to be applicable to the closure of a small hospital.

KEY QUESTION 2. How does the impact of small hospital closures vary based on patient characteristics, geographical location, and the characteristics of the nearest facilities?

Geographic Location

Although studies have found that closing hospitals, especially in rural areas, may increase time to the nearest facility, it is less clear how an increase in travel time affects health outcomes. As just discussed, increases in travel time or distance to the nearest facility after emergency department closure were associated with increased mortality after a stroke[6] and acute MI.[5] Studies of very small (<8 beds) and small (<100 beds) hospital closures, however, had conflicting results about the effect of commuting time on mortality from time-sensitive conditions (see Key Question 1).[9,12]

Characteristics of Nearby Facilities

No studies evaluated whether any characteristics of nearby facilities predicted improved patient outcomes after a small hospital closure. In the study of the closure of small rural hospitals in the U.S.,[3] patients tended to bypass rural hospitals and shift care to urban teaching hospitals following a closure, even though none of these teaching hospitals were within 15 miles of a closed hospital and nine had at least one other non-teaching hospital nearby. This may be one explanation for the lack of an effect on mortality found in this study; however, mortality rates were not analyzed according to which alternate source of care patients used following a closure, so there is insufficient evidence to determine if this was in fact the case.

Patient Characteristics

There is insufficient evidence to determine whether the impact of small hospital closures varies based on patient characteristics (e.g., age, race/ethnicity, socioeconomic status, health conditions, etc.). One study evaluated the effects of downsizing the number of hospital beds in the Winnipeg Hospital System based on age and did not find an increase in mortality associated with older age, consistent with results for the overall group.[8] This study was rated poor quality because it did not control for important confounders.

MAIN FINDINGS

- Nine observational studies reported the effect of hospital closure on patient health outcomes. Only four were conducted in small hospitals (<100 beds), and of these, only one was rated fair quality, for the outcome cause-specific mortality only.
- No studies were conducted in VHA facilities, and the applicability of the evidence to the VA population is low.

KEY QUESTION 1

- There is insufficient evidence to conclude whether the closure of a small hospital affects overall mortality of patients affected by the closure.
- There is low strength evidence that the closure of a hospital increases mortality from time-sensitive conditions (acute MI and unintentional injuries) when it leads to an increase in distance to the nearest facility.
- There is insufficient evidence to conclude whether closure of a small hospital leads to worse self-reported health status among patients affected by the closure.

KEY QUESTION 2

- There is low strength evidence that patients who experience an increase in distance (over 5 miles) or time (greater than 30 minutes) to the nearest facility due to the closure of an emergency department are at greater risk of mortality from some time-sensitive health conditions (stroke, acute MI). Patients in rural communities who experience time-sensitive health conditions (stroke, acute MI) may be at greater risk of mortality when a hospital closes due to longer travel times to emergency departments. Increased mortality is seen when driving time is greater than 30 minutes, or distance is greater than five miles.
- There is insufficient evidence to determine what characteristics of nearby facilities are associated with better outcomes in patients experiencing a hospital closure.

LIMITATIONS

A major limitation was the small body of evidence. Only four studies were conducted in small hospitals and they all had methodological flaws, making their potential for bias at least moderate. There was a lack of evidence about what characteristics may predict higher rates of success of nearby facilities. No study was conducted in a VHA facility, and the applicability of studies conducted in larger, urban settings to the VA population may be low.

There are some general methodological limitations of this Evidence Brief associated with streamlining the traditional systematic review methods in order to synthesize the evidence within a shortened timeframe. Brief or rapid review methodology is still developing and there is not yet consensus on what represents best practice. The findings of this review relate to a narrower range of outcomes than may be of interest to broader audiences of healthcare providers and policymakers. Within the given timeframe, we could only adequately evaluate a limited number of effectiveness outcomes. Hospital closures may have important effects on patients' perceptions of quality of care beyond the effects on health outcomes. Because we focused our review on studies of hospital closure specifically, we did not review the literature that establishes the relationship between distance to healthcare facilities and mortality. Additionally, we must acknowledge the biases that may have been introduced by limiting the number of electronic databases we searched, excluding studies published in languages other than English, and foregoing a specific search for gray literature.

SUPPLEMENTAL MATERIALS

The following supplemental materials are available on the ESP website with this Evidence Brief:

1. Search Strategies
2. List of Excluded Studies
3. Evidence Tables
    a. Data Abstraction
    b. Quality Assessment

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