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# Strategies for Critical Access Hospital Financial and Operational Performance Improvement: A Systematic Review

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## KEY FINDINGS

- Critical Access Hospitals (CAHs) face significant financial challenges due to their unique operational settings.
- This review identifies several promising hospital-level interventions that can improve the financial performance of CAHs, including service line optimization, revenue and cost management, technology adoption, workforce recruitment and retention, and access to capital.

## INTRODUCTION

Critical Access Hospitals (CAHs) are vital to providing health care services in rural areas but often struggle with financial sustainability due to low patient volume, higher acuity among patients, low reimbursement rates, and uncompensated care.<sup>1-3</sup> Since 2005, 71 CAHs have closed or converted to alternative provider types.<sup>4</sup> The Medicare Rural Hospital Flexibility (Flex) Program<sup>5</sup> supports CAHs in identifying and implementing strategies to improve financial and operational performance, with a goal of preserving access to care in rural communities. The purpose of this brief is to review and synthesize the evidence on hospital-level financial performance improvement interventions. State Flex Programs and CAH leaders may use these findings to inform and develop work plans to improve financial and operational outcomes for CAHs.

We define an intervention as ***a targeted action or strategy implemented by a CAH to improve its financial or operational performance. Interventions are designed to address specific challenges faced by CAHs and are evaluated based on measurable outcomes, such as revenue growth, margin improvements, or cost savings.***

## METHODS

On February 9, 2024, we conducted a comprehensive literature search across PubMed (NLM), Scopus (Elsevier), the Cumulative Index of Nursing and Allied Health Literature (CINAHL, EBSCOhost), and ProQuest Healthcare Administration, limiting results to studies published on or after January 1, 2000. Two independent reviewers screened titles, abstracts, and full texts using Covidence, a systematic review tool. Conflicts were resolved through iterative consultations with a senior investigator.



English language studies that covered hospital-level interventions for financial or administrative performance improvement of CAHs in the United States were eligible. Because non-CAH rural hospitals differ substantially from CAHs in terms of size and payment, we limited our search to interventions implemented in CAHs; however, because the CAH designation is unique to the United States, interventions implemented by rural hospitals in developed countries outside of the United States were included if they appeared relevant to the CAH context. Outcomes of interest were financial performance measures, including revenue, costs, profitability, liquidity, financial distress, and closure. [Appendix A](#) provides further details on the search and selection methodology.

## RESULTS

A total of 8,686 citations were identified across all databases. After de-duplication, 5,054 unique studies were screened for inclusion in the beginning. The first screening stage excluded 4,531 studies and resulted in 532 studies available for the title/abstract stage. During title and abstract review, 481 studies were excluded resulting in 42 publications

included in the full text review. During the full text review, an additional two studies were excluded due to being anonymous, and two additional studies were removed because they covered case studies for larger hospitals (non-CAHs). Thus, a total of 38 studies were included in the final analysis. They represented a mix of academic publications (25) and grey literature (13). The 25 academic studies were all observational: 5 mixed methods studies, 2 descriptive studies, 5 case studies, 1 longitudinal cohort study, 5 qualitative studies, 4 cross-sectional studies, and 3 survey-based studies. The remaining 13 non-academic studies were a mix of strategic guidelines and case studies. Grey literature articles focused on successful examples and best practices for improving CAH financial performance. The reviewed literature covered a range of interventions aimed at improving CAH financial performance. For evidence synthesis, the interventions were organized into four categories including service line optimization,<sup>6-10</sup> revenue<sup>11-15</sup> management, cost management,<sup>16-23</sup> technology adoption,<sup>14,18,22,24-28,25,26,29-32</sup> and other strategies.<sup>29,33-37</sup> (Table 1 below and [Appendix B](#))

**TABLE 1. Number of Studies by Intervention Category**

Intervention Category	Intervention Description	Number of Studies
Service line optimization	Adding new services or improvements to existing services	5 <sup>6-10</sup>
Revenue and cost management	Improvements to revenue cycle management or cost savings	13 Revenue - 5 <sup>11-15</sup> Costs - 8 <sup>16-23</sup>
Technology adoption	Using telehealth and health information systems to improve operational efficiency	14 <sup>14,18,22,24-28,29-32</sup>
Other strategies	Workforce programs, partnerships, and capital strategies	6 <sup>25,26,29-32</sup>
<b>Total</b>		<b>38</b>

Figure 1 (see [Appendix A](#) for Methods) depicts a PRISMA diagram summary of our study identification and screening process.



## SERVICE LINE OPTIMIZATION

Five studies examined the use of service line optimization interventions to improve hospitals’ financial performance.<sup>6-10</sup> Among these, three papers focused on the transformational expansion of surgical programs and their contribution to hospital revenue.<sup>6,7,9</sup> The other two studies focused on community needs analysis, market competition,<sup>38</sup> and incremental improvements to the existing mix of services and supporting staff models.<sup>11,39</sup> A few notable service line expansions are highlighted in Table 2 below.<sup>6,7,9</sup>

**TABLE 2. Examples of Service Line Expansions**

Author, Year	Hospital	Location	Bed Size	Intervention	Reported Outcomes
<b>McCollister et al., 2009<sup>9</sup></b>	Cuyuna Regional Medical Center & Riverwood Health Care Center	Crosby, Minnesota and Aitkin, Minnesota	25	<b>Specialty surgery expansion:</b> The hospitals focused on growing technical expertise in minimally invasive surgery rather than investing in traditional clinical specialties that align with the population growth or decline. Over time, minimally invasive surgery became a competitive advantage, an expansion focus, and an expertise area for these hospitals in Minnesota.	Surgeon count grew from 1 to 12  The hospital reported significant growth
<b>Doty et al., 2007<sup>7</sup></b>	Harney District Hospital	Burns, Oregon	25	<b>General surgery expansion:</b> The decision to expand the general surgery program was part of the hospital turnaround story that started with cost-cutting and stabilizing activities. This case study provides a high-level action plan and checklist for evaluating community needs, conducting feasibility analyses, and executing the expansion of the general surgery program.	Increased year-over-year surgical revenue from 3.9% to 8.9% of total revenue
<b>Page et al., 2021<sup>6</sup></b>	Chatham Hospital	Siler City, North Carolina	25	<b>Maternity care expansion:</b> The hospital conducted a market analysis and identified additional patients it could serve. The hospital used the relationship with a tertiary care center (UNC Hospitals) to re-allocate low-risk Medicaid births to the CAH. The objective was to take advantage of the 101% allowable cost reimbursement structure and balance the case mix between the PPS model and the CAH reimbursement model, since the current PPS model results in negative margins for obstetric care at UNC hospitals, where payments are fixed per diagnosis-related group, regardless of actual service costs.	The program’s holistic evaluation is ongoing; however, the hospital is on track to meet its first-year goal of delivering at least 12 babies a month.



One study from a small, rural hospital in Canada showed the benefits of Monte Carlo simulation in improving surgical workflows and optimizing the operating room (OR) schedule. Monte Carlo simulation is an analytical method that allows for the prediction of desired outcomes under uncertain conditions and variable inputs. This analytical approach helped in identifying tactical improvements to OR utilization and scheduling, that resulted in a reported increase in procedural volume by 38% (from a monthly average of 30-35 surgical procedures to 42). The hospital formed a partnership with a university analytics research unit to execute this project.<sup>39</sup>

Findings showing financial benefits from surgery expansion are consistent with the established relationship between rural hospital profitability and surgical volume.<sup>8,10,40</sup> Karim et al. suggest that higher surgical volume is positively and significantly associated with operating margin<sup>40</sup>; although there is considerable variability in the ability to achieve financial sustainability through service line optimization among CAHs.<sup>2</sup> Key hospital characteristics such as population density, community needs, geographic distances, existing health care infrastructure, and institutional priorities impact decision-making related to the expansion and improvement of surgical services.<sup>1,40</sup> There is also room for innovative optimization of service and payment mix, as in the case with maternity care expansion.<sup>6</sup> This underscores the importance of adaptive, community-centric approaches to sustain and expand care delivery models at CAHs.

***Overall, the studies covering service line expansions suggest that starting or expanding a new service is a costly, complex, and long-term investment, especially for rural surgery programs; however, the financial benefit can be significant.<sup>7-9</sup> A more incremental approach, such as partnering with tertiary centers to optimize service and payment mix across facilities, appears to yield more immediate results.<sup>6</sup>***

## REVENUE AND COST INTERVENTIONS

The search captured five studies that focused on interventions that could improve CAH revenue management<sup>11-15</sup> and eight studies that focused on cost management.<sup>16-23</sup>

One option for increasing revenue is through non-operating revenue (NOR), such as medical space rentals, investments, and contributions.<sup>15</sup> A 2024 study on NOR found that many CAHs benefit from this revenue source.<sup>15</sup> Another study examined the relationship between quality improvement and hospital profitability, and suggested that improving quality was significantly associated with hospital profitability. However, the study sample was broad and did not specifically address the impact on CAHs<sup>41</sup> as compared to other types of rural hospitals. A summary of relevant CAH intervention highlights for revenue management is presented in Table 3.



**TABLE 3. Examples for Revenue Management**

Author, Year	Hospital	Location	Bed Size	Intervention	Reported Outcomes
Hegwer, 2021 <sup>12</sup>	Baylor Scott and White	Taylor, Texas	25	<b>Training:</b> The hospital trained clinic registration staff to educate patients about their financial responsibility and payment plans.	Increase in service collections by 47%  Reduction of scheduled out-of-network volume by 88%
Hegwer, 2021 <sup>12</sup>	Cass County Memorial Hospital	Atlantic, Iowa	25	<b>Transparent performance measurement:</b> The hospital prioritized sharing performance metrics for accounts receivable with staff and involved them in improving productivity and processes. Additionally, the hospital utilizes an estimator tool that connects with the EMR system to retrieve patient estimates based on charges from comparable patients.	Reduced net accounts receivable by 30 days in FY2020
Stroudwater, 2021 <sup>13</sup>	Ohio County Healthcare	Kentucky	21	The hospital performed a <b>chargemaster review</b> . The results demonstrated that they were missing revenue opportunities. For example, the chargemaster was priced below the Medicare Fee schedule.	Up to 7% revenue increase
Haque et al., 2023 <sup>14,24</sup>	8 CAHs	3 (Montana) 1 (North Dakota) 4 (Nevada)	n/a	<b>Telehealth:</b> The hospitals participating in the Frontier Community Health Integration Model expressed the intention to continue offering telehealth services for behavioral health, pain management, and substance use at \$26 per telehealth encounter instead of 101% of reasonable costs.	Telehealth services billed to Medicare increased; however, volume was low.  The hospital noted it as a value-add for their communities
Pitcher et al., 2023 <sup>15</sup>	n/a	Nationwide	n/a	<b>Non-operating revenue (NOR):</b> Non-operating revenue is an important source of revenue for CAHs. Examples of NOR include: medical space rentals, investments, contributions.	This non-operating revenue provides CAHs with additional resources for operations and development

Some of the most significant costs for rural and CAHs include staffing, drugs, and technology.<sup>23</sup> The 340B Drug Pricing Program helps address some of the drug cost challenges for CAHs<sup>42</sup>; however, staffing and technology costs remain persistent challenges. Relevant CAH intervention examples for cost management from the reviewed literature are presented in Table 4.



**TABLE 4. Examples for Cost Management**

Author, Year	Hospital	Location	Bed Size	Intervention	Reported Outcomes
<b>Bunge, 2018<sup>19</sup></b>	Summit Pacific Medical Center	Elma, Washington State	10	<b>Staffing model:</b> The hospital implemented an innovative staffing model - “hybrid rotating hospitalist.” This model ensures that existing physicians play dual roles: they make inpatient rounds in the morning and reserve afternoons for outpatient appointments. The benefit of this model is the reduction of staffing costs by 50% compared to a full hospitalist model.	Staff-related cost reduction to the hospital by 50%  Reductions in unnecessary consultations
<b>Ward et al., 2018<sup>18</sup></b>	Seven CAHs	Iowa, Minnesota, North Dakota, South Dakota, and Nebraska	n/a	<b>Virtual staffing model:</b> Instead of hiring a full-time emergency department physician, the hospitals used an advanced practice provider and a tele-emergency department physician, decreasing ED staffing costs.	Average savings of \$117,000 per year
<b>Vesely, Rebecca 2015<sup>20</sup></b>	Margaret Mary Health	Batesville, Indiana	25	<b>Economies of scale via ACO participation:</b> The hospital joined an alliance of hospitals (the National Rural ACO Consortium), and capitalized on their strong primary care program and the data it could provide. This strategy allowed the hospital to benefit from ‘economies of scale’, a concept where the average costs decrease as the volume of production increases, thereby reducing the per-unit cost of health care services. For example, hospitals pay \$10,000 monthly to participate in an ACO. In return, they receive benefits from the consortium, such as data insights, legal advice and access to specialized staff.	Annual Medicare costs per beneficiary were \$2,000 less than the average before starting the ACO. Medicare beneficiary data is expected to provide additional value, allowing for more efficient care delivery (e.g. reduced missed appointments due to transportation)
<b>Anthone et al., 2019<sup>21</sup></b>	CHI Health System, 5 CAHs out of 14 hospitals	Iowa/ Nebraska	18-25	<b>Economies of scale:</b> The hospital system implemented an antimicrobial stewardship program across the hospital system following CMS guidance. One to two exciting hospital pharmacists per site reviewed daily antimicrobial alerts alongside their regular duties. They were supported by a contracted infectious disease physician who provided on-demand guidance. Pharmacists then relayed tailored recommendations to prescribing providers.	The hospital system achieved savings by utilizing current staff without additional hires, minimizing training costs, and reducing inappropriate antimicrobial use through targeted interventions. These interventions lowered drug costs and prevented costly implications like resistance or adverse events.



To summarize, personnel training and performance to support the revenue cycle,<sup>12</sup> non-operating revenue,<sup>15</sup> increasing billed telehealth services,<sup>14</sup> and performing a charge master review<sup>13</sup> were effective in increasing revenues for CAHs. Interventions related to innovative staffing models,<sup>18,19</sup> telehealth,<sup>18</sup> economies of scale<sup>20</sup>, and quality improvement,<sup>21</sup> were effective in reducing CAHs costs.

### TECHNOLOGY ADOPTION

Among 14 studies focusing on technology adoption, eight papers<sup>14,18,22,24–28</sup> highlighted the role of telehealth in improving revenue and operational efficiency. Six studies focused on analyzing the costs and benefits resulting from IT outsourcing and Electronic Medical Records (EMR) adoption<sup>25,26,29–32</sup>

#### *Telehealth*

The financial impact of telehealth adoption in rural hospitals is influenced by various hospital and community characteristics,<sup>28</sup> resulting in mixed evidence regarding its economic benefits. Studies suggest that rural hospitals, including CAHs, that have implemented telehealth tend to achieve higher margins than non-adopters.<sup>28</sup> However, the specific factors driving these improved margins are not well documented. For example, Wakefield et al. found that telehealth can enable CAHs to expand pharmacy services, support 24/7 operations, and increase prescription volume.<sup>22</sup> The study reported benefits ranging from 700 to 2,300 additional pharmaceutical orders.<sup>22</sup> Nevertheless, these results vary widely, making it difficult to reliably estimate overall financial gains. Another study identified only modest revenue improvements from telehealth billing.<sup>14</sup>

On the cost side, rural hospitals offering telehealth services, including CAHs, generally report lower total emergency department (ED) costs.<sup>31</sup> Yet, the financial benefits remain highly context-dependent.<sup>27</sup> Mackinney et al. examined the costs and benefits of tele-emergency services in CAHs and concluded that the financial viability of such investments depends on

each hospital's unique revenue and expense profile.<sup>27</sup> In their study of 49 CAHs in South Dakota using tele-emergency services since 2012, Mackinney et al. found that each ED encounter supported by tele-emergency services generated approximately \$60 in additional revenue.<sup>27</sup> However, determining whether this translates to significant profit or loss requires further hospital-specific financial analysis.<sup>27</sup> The authors also highlighted the broader challenge of conducting robust financial analyses of telehealth, as noted by other researchers, including Mistry, Wade, and De la Torre-Diez.<sup>27</sup> To address this gap, Mackinney et al. recommended that hospitals develop tailored pro forma financial models that consider factors such as revenue, cost savings, and the implementation and maintenance costs of telehealth systems.<sup>27</sup>

Finally, Haque et al. emphasized the need for ongoing telehealth implementation and maintenance support for CAHs to ensure successful telehealth adoption, given the substantial upfront and recurring costs involved.<sup>14,24</sup>

#### *Other Information Technology Interventions*

Implementing a strong health information technology (HIT) infrastructure could potentially be a solution for the increasing challenges of providing quality health care while staying financially viable.<sup>25</sup> CAH adoption of HIT is encouraged by Medicare payment incentives<sup>43</sup>; however, the adoption among CAHs has been slower than for other rural hospitals.<sup>25</sup> A survey of CAHs in Iowa highlighted both the benefits and challenges from implementing HIT systems.<sup>30</sup> Benefits included increased Medicare reimbursements and improved financial margins for CAHs that incorporated HIT investments into their cost structure.<sup>30</sup> Challenges such as limited financial resources, lack of high-speed internet connections, and staffing shortages remain significant barriers to investments in complex HIT systems.<sup>44</sup> Network-affiliated hospitals were more likely to adopt EMR systems than independent hospitals due to cost-sharing.<sup>29</sup>



In summary, while CAHs and rural hospitals have made progress in HIT adoption, they face significant barriers in fully implementing advanced EMR systems and computerized provider order entry (CPOE).<sup>26</sup> Network affiliation improves adoption rates, but smaller rural facilities remain far behind national goals.<sup>26</sup> In this context, case studies highlighting CAH investments in emerging tools like robotic process automation, such as at Sanford Health hospital in Sioux Falls, SD, appear to be isolated success stories rather than a widespread trend.<sup>32</sup>

### OTHER INTERVENTIONS

A variety of other interventions such as personnel programs, partnerships, and capital strategies were highlighted in six studies. Three articles covered workforce issues such as turnover challenges and other retention strategies. For example, one grey literature article presented a case study of Rusk County Memorial Hospital in Ladysmith, Wisconsin. The hospital resolved a recruitment and turnover issue among primary care physicians unwilling to take call duty at the hospital<sup>33</sup> by implementing a nurse-hospitalist program. As part of this program, the hospital hired three nurse practitioners to provide 24/7 coverage through a “7-7-7” model.<sup>33</sup> Each nurse would work 24 hours a day for seven days, sleeping at the hospital during their on-duty week, followed by two weeks off.<sup>33</sup> This schedule removed the need for nurse practitioners to relocate to Ladysmith.<sup>33</sup> The hospital saved on the physician costs and the additional subsidy was used to offset billing shortfalls due to low patient volume.<sup>33</sup>

Offering incentives and adapting service delivery to the needs of physicians was shown to be an effective workforce strategy in a 25-bed hospital in rural Australia.<sup>34</sup> The authors shared the story of Proserpine Hospital in Northern Queensland that developed a partnership with James Cook University Medical School.<sup>34</sup> The hospital transformed from a single-doctor practice into a teaching hospital with a

multidisciplinary staff and a broad scope of services, including acute care, obstetrics, and surgery.<sup>34</sup> The university and the hospital worked together to evolve and match existing medical teaching capacity with new clinicians’ focus.<sup>34</sup> To further support clinical education, the hospital used federal grants to establish attractive housing for students.<sup>34</sup> Culturally, students were actively integrated into the care team, entrusted with meaningful clinical responsibilities under supervision, and welcomed into a supportive environment.<sup>34</sup> The resulting high profile and reputation for excellence have played a key role in recruiting and retaining medical staff, ensuring the hospital’s ongoing sustainability and growth as a center for clinical care and education.<sup>34</sup>

A more general study suggested a positive effect of Magnet Recognition nursing excellence designation on hospital financial performance; however, it did not specifically call out any CAHs.<sup>37</sup>

The remaining three studies highlighted a range of creative financial and capital access strategies for CAHs.<sup>29,35,36</sup> Wilson suggested a number of approaches and lending programs for CAHs, such as multiple capital and funding applications. For example, applying to HUD’s 242 mortgage insurance program allows issuers to issue bonds, and the USDA Community Facilities Program offers different types of loans and grants.<sup>35</sup> However, the article lacked outcome measures to demonstrate the effectiveness of these programs.<sup>35</sup> Partnerships and joint ventures with larger systems can offer CAHs a market advantage.<sup>36</sup> One example is the hub-and-spoke system of Willis-Knighton Health System with North Caddo Medical Center, a 25-bed CAH located in Vivian, Louisiana.<sup>36</sup> In this partnership model, basic and simple health care services were provided at the smaller local facilities, and more complex interventions were directed to the main campus for treatment.<sup>36</sup> These partnership models can also provide access to working capital by leveraging economies of scale for outsourcing.<sup>29</sup>



Finally, community integration and needs assessment have been mentioned repeatedly as important strategies for improving financial performance.<sup>8,45,46</sup> Specific examples referenced above are consistent with a locally-centered approach.<sup>6,7</sup>

### LIMITATIONS

This review has several limitations. First, the heterogeneity of interventions and outcome measures made it challenging to compare the effectiveness of different strategies consistently. Second, most included studies were observational, and some were case studies from grey literature, limiting our ability to draw causal inferences about the effectiveness of interventions. Third, publication bias may have influenced the results, as unsuccessful interventions are less likely to be published. Finally, several studies did not address CAHs separately, making it challenging to evaluate whether the interventions would be a good fit for CAHs.

### CONCLUSIONS

This systematic review provides valuable insights into practical strategies for improving the financial performance of CAHs and rural hospitals. The findings suggest that a combination of service optimization, revenue management strategies, efficient staff mix, cost management, and technology adoption can significantly enhance financial performance.<sup>1</sup> However, the specific mix of interventions should be tailored to each hospital's unique context and needs.<sup>6-8,45,46</sup>

Future research on this topic could focus on the relationships between CAHs' financial performance and quality,<sup>41</sup> hospital recognition programs,<sup>37</sup> and innovative health services delivery methods.<sup>23</sup> Additionally, long-term follow-up studies are needed to assess the sustainability of financial improvements achieved through various interventions.

State Flex Programs and hospital administrators can use these findings to inform decision-making and resource allocation. By implementing evidence-based strategies and lessons learned from other hospitals, CAHs can improve their financial performance, ensuring continued access to essential health care services in rural communities.

For more information on this report, please contact Kristin Reiter, [reiter@email.unc.edu](mailto:reiter@email.unc.edu).

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## APPENDIX A: METHODOLOGY

### *Eligibility Criteria*

Studies were included if they met the following criteria: 1) Population: rural hospital in a developed country or CAHs in the United States; 2) Intervention: hospital-level interventions for financial or administrative performance improvement; 3) Outcomes: any measure of financial performance including profitability, viability, financial distress, closure, liquidity, and operating margin; 4) Setting: United States and other developed countries.

Study Design: primary or secondary data analysis. Studies were excluded if they met any of the following criteria: 1) Population: considered urban hospitals only; 2) Intervention: any factor external to the organization, such as Medicaid expansion or local demographic changes; 3) Financial performance outcomes related to the factors external to the organization (Medicaid expansion, acquisition); or 4) Setting: discussed only low or middle-income designated countries. Studies published only in non-English languages or before 2000 were excluded.

### *Information Sources*

A health sciences librarian developed a comprehensive search strategy for PubMed that included both MeSH terms and keywords around the concepts of 1) rural or CAHs and 2) financial and administrative performance improvements. Results were limited to studies published after 2000 and editorials, comments, and letters were excluded. The search was then translated and executed in Scopus (Elsevier), the Cumulative Index of Nursing and Allied Health Literature (CINAHL, EBSCOhost), and ProQuest Healthcare Administration. All searches were conducted on February 9, 2024 (Table 5).

**TABLE 5. Information Sources**

Source	Date Searched	Number of Results	Unique results
PubMed	2/9/24	2,689	2,689
Scopus	2/9/24	3,503	1,070
CINAHL	2/9/24	1,070	395
ProQuest Healthcare Administration	2/9/24	1,424	932
<b>Total (Including Duplicates)</b>			<b>8,686</b>
<b>Imported into Covidence</b>			<b>5,070</b>
<b>Total (After all duplicates removed)</b>			<b>5,054</b>



*Database Searches*

**TABLE 6. PubMed (NLM) Search**

Searched February 9, 2024

Search	Query	Number of Results
1	“critical access hospital”[tw] OR “critical access hospitals”[tw] OR “Hospitals, Rural”[mesh] OR “limited-service hospital”[tw] OR “medicare dependent hospital”[tiab:~1] OR “medicare dependent hospitals”[tw] OR “rural hospital”[tw] OR “rural hospitals”[tw] OR “rural referral center”[tw] OR “rural referral centers”[tw] OR “rural-prospective payment”[tw] OR “sole community hospital”[tw] OR “sole community hospitals”[tw] OR “state office of rural health”[tiab:~0] OR “state offices of rural health”[tiab:~0]	8,067
2	“administrative burden”[tw] OR affiliated[tw] OR affiliation[tw] OR bankrupt[tw] OR bankruptcies[tw] OR bankruptcy[tw] OR benchmark[tw] OR benchmarks[tw] OR bill[tw] OR billing[tw] OR bills[tw] OR Capital[tw] OR “cash flow”[tw] OR closing[tw] OR closings[tw] OR closure[tw] OR closures[tw] OR compete[tw] OR competition[tw] OR cost[tw] OR “cost savings”[mesh] OR “cost-effectiveness analysis”[mesh] OR costs[tw] OR cost-saving[tw] OR cost-savings[tw] OR diversification[tw] OR diversified[tw] OR diversify[tw] OR economic[tw] OR “economic factors”[mesh] OR economics[tw] OR “economics, hospital”[mesh] OR efficiencies[tw] OR efficiency[tw] OR efficient[tw] OR equity[tw] OR finance[tw] OR financial[tw] OR “financial management”[mesh] OR “financial management, hospital”[mesh] OR financially[tw] OR financials[tw] OR “fiscal distress”[tw] OR “fiscal improvement”[tiab:~0] OR “fiscal sustainability”[tw] OR fundraising[tw] OR “Hospital Administration/economics”[mesh] OR “Hospital Planning/economics”[mesh] OR incentivize[tw] OR innovate[tw] OR innovation[tw] OR liquidity[tw] OR management[tw] OR margin[tw] OR market[tw] OR “medical mall”[tw] OR “medical malls”[tw] OR merger[tw] OR mergers[tw] OR ownership[tw] OR pay[tw] OR payer[tw] OR payers[tw] OR paying[tw] OR profit[tw] OR profitability[tw] OR profitable[tw] OR purchas*[tw] OR reimburse[tw] OR reimbursement[tw] OR reimburses[tw] OR restructure[tw] OR restructuring[tw] OR revenue[tw] OR salaries[tw] OR salary[tw] OR savings[tw] OR staffing[tw] OR strategic[tw] OR strategies[tw] OR strategy[tw]	5,769,140
3	#1 AND #2	4,186
4	#3 AND (2000:2024[pdat])	2,730
5	#4 NOT (comment[pt] OR editorial[pt] OR letter[pt])	2,689
<b>Total (After Duplicates Removed)</b>		<b>2,681</b>



**TABLE 7. Scopus (Elsevier) Search**

Searched February 9, 2024

Search	Query	Number of Results
1	TITLE-ABS-KEY("critical access hospital" OR "critical access hospitals" OR "hospitals, rural" OR "limited-service hospital" OR "medicare dependent hospital" OR "medicare dependent hospitals" OR "rural hospital" OR "rural hospitals" OR "rural referral center" OR "rural referral centers" OR "rural-prospective payment" OR "sole community hospital" OR "sole community hospitals" OR "state office of rural health" OR "state offices of rural health")	9042
2	TITLE-ABS-KEY("administrative burden" OR affiliated OR affiliation OR bankrupt OR bankruptcies OR bankruptcy OR benchmark OR benchmarks OR bill OR billing OR bills OR Capital OR "cash flow" OR closing OR closings OR closure OR closures OR compete OR competition OR cost OR costs OR cost-saving OR cost-savings OR diversification OR diversified OR diversify OR economic OR economics OR efficiencies OR efficiency OR efficient OR equity OR finance OR financial OR "financial management" OR financially OR financials OR "fiscal distress" OR "fiscal improvement" OR "fiscal sustainability" OR fundraising OR incentivize OR innovate OR innovation OR liquidity OR management OR margin OR market OR "medical mall" OR "medical malls" OR merger OR mergers OR ownership OR pay OR payer OR payers OR paying OR profit OR profitability OR profitable OR purchas* OR reimburse OR reimbursed OR reimbursement OR reimburses OR restructure OR restructuring OR revenue OR salaries OR salary OR savings OR staffing OR strategic OR strategies OR strategy)	20,135,198
3	1 AND 2	5,549
4	3 AND (PUBYEAR > 1999)	3,707
5	4 AND NOT (DOCTYPE(bk) OR DOCTYPE(cp) OR DOCTYPE(ed) OR DOCTYPE(le))	3,503
<b>Total (After Duplicates Removed)</b>		<b>1,070</b>

**TABLE 8. CINAHL (EBSCOhost) Search**

Searched February 9, 2024

Search	Query	Number of Results
1	(MH "Hospitals, Rural") OR (TI("critical access hospital" OR "critical access hospitals" OR "limited-service hospital" OR "medicare dependent hospital" OR "medicare dependent hospitals" OR "rural hospital" OR "rural hospitals" OR "rural referral center" OR "rural referral centers" OR "rural-prospective payment" OR "sole community hospital" OR "sole community hospitals" OR "state office of rural health" OR "state offices of rural health")) OR (AB("critical access hospital" OR "critical access hospitals" OR "limited-service hospital" OR "medicare dependent hospital" OR "medicare dependent hospitals" OR "rural hospital" OR "rural hospitals" OR "rural referral center" OR "rural referral centers" OR "rural-prospective payment" OR "sole community hospital" OR "sole community hospitals" OR "state office of rural health" OR "state offices of rural health")) OR (SU("critical access hospital" OR "critical access hospitals" OR "limited-service hospital" OR "medicare dependent hospital" OR "medicare dependent hospitals" OR "rural hospital" OR "rural hospitals" OR "rural referral center" OR "rural referral centers" OR "rural-prospective payment" OR "sole community hospital" OR "sole community hospitals" OR "state office of rural health" OR "state offices of rural health"))	4,614



## Flex Monitoring Team

University of Minnesota | University of North Carolina at Chapel Hill | University of Southern Maine

Search	Query	Number of Results
2	(MH "cost savings") OR (MH "Cost Effectiveness Analysis") OR (MH "Economic Factors") OR (MH "Financial management") OR (MH "Health Facility Administration/EC") OR (MH "Hospital Planning/EC") OR (TI("administrative burden" OR affiliated OR affiliation OR bankrupt OR bankruptcies OR bankruptcy OR benchmark OR benchmarks OR bill OR billing OR bills OR Capital OR "cash flow" OR closing OR closings OR closure OR closures OR compete OR competition OR cost OR costs OR cost-saving OR cost-savings OR diversification OR diversified OR diversify OR economic OR economics OR efficiencies OR efficiency OR efficient OR equity OR finance OR financial OR financially OR financials OR "fiscal distress" OR "fiscal improvement" OR "fiscal sustainability" OR fundraising OR incentivize OR innovate OR innovation OR liquidity OR management OR margin OR market OR "medical mall" OR "medical malls" OR merger OR mergers OR ownership OR pay OR payer OR payers OR paying OR profit OR profitability OR profitable OR purchas* OR reimburse OR reimbursed OR reimbursement OR reimburses OR restructure OR restructuring OR revenue OR salaries OR salary OR savings OR staffing OR strategic OR strategies OR strategy)) OR (AB("administrative burden" OR affiliated OR affiliation OR bankrupt OR bankruptcies OR bankruptcy OR benchmark OR benchmarks OR bill OR billing OR bills OR Capital OR "cash flow" OR closing OR closings OR closure OR closures OR compete OR competition OR cost OR costs OR cost-saving OR cost-savings OR diversification OR diversified OR diversify OR economic OR economics OR efficiencies OR efficiency OR efficient OR equity OR finance OR financial OR financially OR financials OR "fiscal distress" OR "fiscal improvement" OR "fiscal sustainability" OR fundraising OR incentivize OR innovate OR innovation OR liquidity OR management OR margin OR market OR "medical mall" OR "medical malls" OR merger OR mergers OR ownership OR pay OR payer OR payers OR paying OR profit OR profitability OR profitable OR purchas* OR reimburse OR reimbursed OR reimbursement OR reimburses OR restructure OR restructuring OR revenue OR salaries OR salary OR savings OR staffing OR strategic OR strategies OR strategy)) OR (SU("administrative burden" OR affiliated OR affiliation OR bankrupt OR bankruptcies OR bankruptcy OR benchmark OR benchmarks OR bill OR billing OR bills OR Capital OR "cash flow" OR closing OR closings OR closure OR closures OR compete OR competition OR cost OR costs OR cost-saving OR cost-savings OR diversification OR diversified OR diversify OR economic OR economics OR efficiencies OR efficiency OR efficient OR equity OR finance OR financial OR financially OR financials OR "fiscal distress" OR "fiscal improvement" OR "fiscal sustainability" OR fundraising OR incentivize OR innovate OR innovation OR liquidity OR management OR margin OR market OR "medical mall" OR "medical malls" OR merger OR mergers OR ownership OR pay OR payer OR payers OR paying OR profit OR profitability OR profitable OR purchas* OR reimburse OR reimbursed OR reimbursement OR reimburses OR restructure OR restructuring OR revenue OR salaries OR salary OR savings OR staffing OR strategic OR strategies OR strategy))	1,655,657
3	S1 AND S2	1,267
4	S3 NOT (ZT "book") OR (ZT "book review") OR (ZT "commentary") OR (ZT "editorial") OR (ZT "letter") OR (ZT "dissertation") OR (ZT "newspaper") OR (ZT "masters thesis")	1,190
5	Filter applied: Date After 2000	1,070
<b>Total (After Duplicates Removed)</b>		<b>391</b>



**TABLE 9. ProQuest Healthcare Administration (ProQuest) Search**

Searched February 9, 2024

Search	Query	Number of Results
1	MAINSUBJECT.EXACT("Rural health care") OR (NOFT("critical access hospital" OR "critical access hospitals" OR "limited-service hospital" OR "medicare dependent hospital" OR "medicare dependent hospitals" OR "rural hospital" OR "rural hospitals" OR "rural referral center" OR "rural referral centers" OR "rural-prospective payment" OR "sole community hospital" OR "sole community hospitals" OR "state office of rural health" OR "state offices of rural health"))	4,834
2	MAINSUBJECT.EXACT("Cost reduction") OR MAINSUBJECT.EXACT("Cost analysis") OR MAINSUBJECT.EXACT("Economic factors") OR MAINSUBJECT.EXACT("Financial management") OR MAINSUBJECT.EXACT("hospital administration") OR (NOFT("administrative burden" OR affiliated OR affiliation OR bankrupt OR bankruptcies OR bankruptcy OR benchmark OR benchmarks OR bill OR billing OR bills OR Capital OR "cash flow" OR closing OR closings OR closure OR closures OR compete OR competition OR cost OR costs OR cost-saving OR cost-savings OR diversification OR diversified OR diversify OR economic OR Economics OR efficiencies OR efficiency OR efficient OR equity OR finance OR financial OR financially OR financials OR "fiscal distress" OR "fiscal improvement" OR "fiscal sustainability" OR fundraising OR incentivize OR innovate OR innovation OR liquidity OR management OR margin OR market OR "medical mall" OR "medical malls" OR merger OR mergers OR ownership OR pay OR payer OR payers OR paying OR profit OR profitability OR profitable OR purchas* OR reimburse OR reimbursed OR reimbursement OR reimburses OR restructure OR restructuring OR revenue OR salaries OR salary OR savings OR staffing OR strategic OR strategies OR strategy))	3,158,808
3	[S1] AND [S2]	3,624
4	Filter applied: NOT (News AND Dissertation/Thesis AND Commentary AND Interview AND Letter To The Editor AND Correspondence AND Conference Proceeding AND Biography AND Fiction AND Front Matter)	2,160
5	Filter applied: NOT (Magazines AND Blogs, Podcasts, & Websites)	2,070
6	Filter applied: 2000-01-01 - 2024	1,424
<b>Total (After Duplicates Removed)</b>		<b>928</b>

**Selection Process**

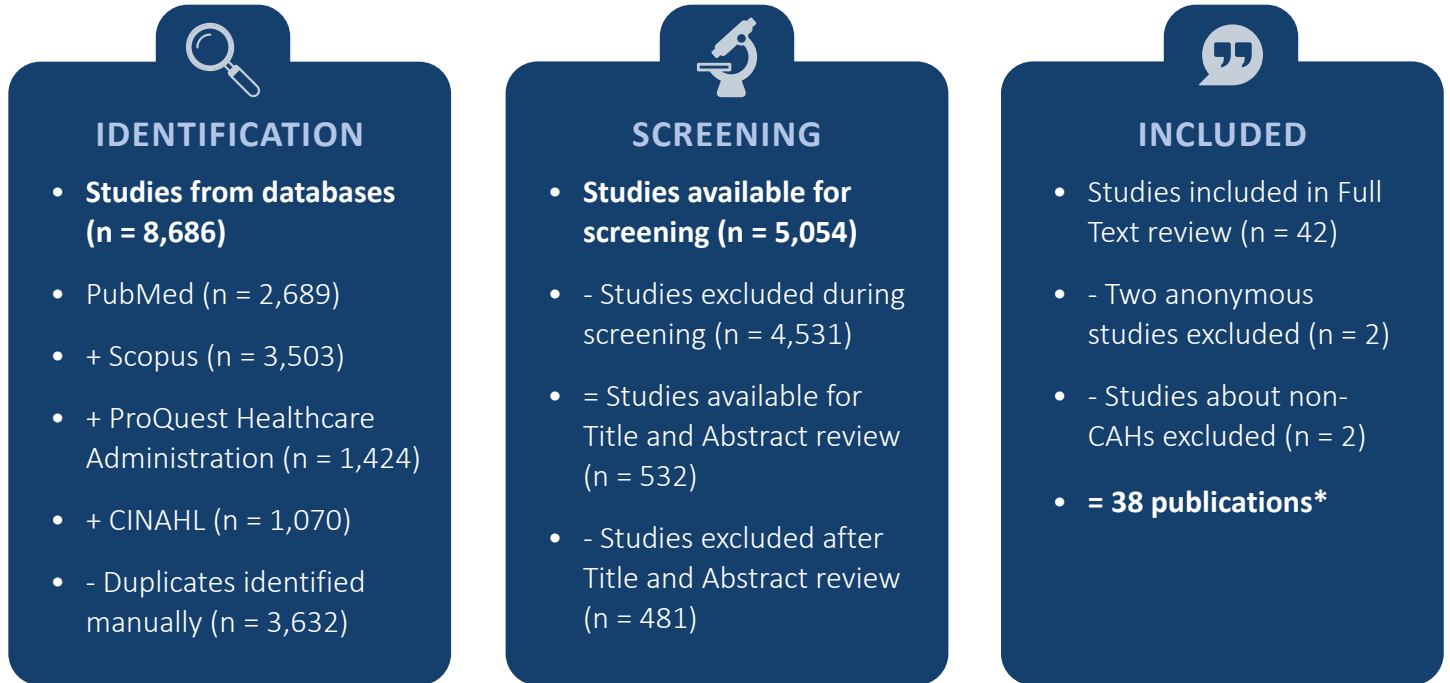
Citations from all bibliographic databases were imported into EndNote and deduplicated. The remaining unique citations were exported from EndNote into Covidence Systematic Review Software for screening. After a pilot screening of seventy-five studies to calibrate reviewer agreement, two independent reviewers screened the titles and abstracts of all studies. Conflicts were resolved by iterative consultations with the principal investigator, Kristin Reiter.

**Results**

A total of 8,686 citations were identified across all databases. After de-duplication, 5,054 unique studies were screened for inclusion in the beginning. The first screening stage excluded 4,531 studies and resulted in 532 studies available for the title/abstract stage. During title and abstract review, 481 studies were excluded resulting in 42 publications included in the full text review. During the full text review, additional two studies were excluded due to being anonymous, and two additional studies were removed because they covered case studies for larger hospitals (non-CAHs). Thus, a total of 38 studies were included in the final analysis.



**FIGURE 1. PRISMA Flow Diagram**



\* Initially, 42 studies were sought for full text review; two studies were later excluded due to being anonymous, and two additional studies were removed because they covered case studies for larger hospitals (non-CAHs). As such, a total of 38 studies were included in the final analysis.



**APPENDIX B: EVIDENCE TABLE**

The evidence table below organizes research publications and grey literature findings by intervention category.

**TABLE 10. “Evidence of Interventions”:**

Intervention	Source
<p><b>Service line optimization</b></p>	<ul style="list-style-type: none"> <li>Page CP, Chetwynd E, Zolotor AJ, Holmes GM, Hawes EM. Building the Clinical and Business Case for Opening Maternity Care Units in Critical Access Hospitals. <i>NEJM Catal.</i> 2021;2(5):CAT.21.0027. doi:10.1056/CAT.21.0027</li> <li>Doty B, Heneghan SJ, Zuckerman R. General Surgery Contributes to the Financial Health of Rural Hospitals and Communities. <i>Surg Clin North Am.</i> 2009;89(6):1383-1387. doi:10.1016/j.suc.2009.07.008</li> <li>Hopper W, Zeller R, Burke R, Lindsey T. The association between operating margin and surgical diversity at Critical Access Hospitals. <i>J Osteopath Med.</i> 2022;122(7):339-345. doi:10.1515/jom-2022-0028</li> <li>Doty BC, Heneghan S, Zuckerman R. Starting a General Surgery Program at a Small Rural Critical Access Hospital: A Case Study From Southeastern Oregon. <i>J Rural Health.</i> 2007;23(4):306-313. doi:10.1111/j.1748-0361.2007.00108.x</li> <li>McCollister HM, Severson PA, LeMieur TP, Roberts SA, Gujer MW. Building and Maintaining a Successful Surgery Program in Rural Minnesota. <i>Surg Clin North Am.</i> 2009;89(6):1349-1357. doi:10.1016/j.suc.2009.09.011</li> </ul>
<p><b>Revenue management</b></p>	<ul style="list-style-type: none"> <li>Hegwer LR. How three healthcare organizations focus on access and transparency to drive revenue cycle performance. HFMA. August 28, 2021. Accessed March 18, 2025. <a href="https://www.hfma.org/revenue-cycle/patient-access/how-3-healthcare-organizations-are-focusing-on-access-and-transp/">https://www.hfma.org/revenue-cycle/patient-access/how-3-healthcare-organizations-are-focusing-on-access-and-transp/</a></li> <li>Stroudwater. <i>Developing a Method to Manage CDM and Review Revenue Opportunities.</i> <a href="https://www.stroudwater.com/case-study/developing-a-method-to-manage-cdm-and-review-revenue-opportunities/">https://www.stroudwater.com/case-study/developing-a-method-to-manage-cdm-and-review-revenue-opportunities/</a></li> <li>Ozer R, Richards G. Optimizing surgical capacity for a rural hospital through monte carlo simulation. <i>J Healthc Qual.</i> June 25, 2015. doi:10.1097/01.JHQ.0000462686.55382.3d</li> <li>Haque S, DeStefano S, Banger A, Rutledge R, Romaine M. Telehealth Impact in Frontier Critical Access Hospitals: Mixed Methods Evaluation. <i>JMIR Form Res.</i> 2023;7:e49591. doi:10.2196/49591</li> <li>Pitcher A, Zhang R, Gurzenda S, Pink G, Reiter K. Non-operating revenue is an important source of funding for rural hospitals, especially those that are government-owned. <i>J Rural Health.</i> 2024;40(2):249-258. doi:10.1111/jrh.12797</li> </ul>
<p><b>Cost management</b></p>	<ul style="list-style-type: none"> <li>Feder JL. Charting A Life-and-Health Cycle and Expanded Primary Care Options for Patients in Wisconsin. <i>Health Aff (Millwood).</i> 2011;30(3):387-389. doi:10.1377/hlthaff.2011.0062</li> <li>Wang BB, Wan TT, Falk JA, Goodwin D. Management strategies and financial performance in rural and urban hospitals. <i>J Med Syst.</i> 2001;25(4):241-255. doi:10.1023/a:1010775104091</li> <li>Ward MM, Merchant KAS, Carter KD, et al. Use of Telemedicine for ED Physician Coverage in Critical Access Hospitals Increased After CMS Policy Clarification. <i>Health Aff (Millwood).</i> 2018;37(12):2037-2044. doi:10.1377/hlthaff.2018.05103</li> <li>Bunge P. A Model for Internal Medicine Physicians in a Small Rural Hospital. Rural Remote Health. Published online August 13, 2018. doi:10.22605/RRH4419</li> <li>Vesely R. The Power of Rural Alliances   AHA Trustee Services. AHA Trustee Services. Accessed April 9, 2025. <a href="https://trustees.aha.org/articles/797-the-power-of-rural-alliances">https://trustees.aha.org/articles/797-the-power-of-rural-alliances</a></li> <li>Anthone J, Boldt D, Alexander B, et al. Implementation of a Health-System Wide Antimicrobial Stewardship Program in Omaha, NE. <i>Pharmacy.</i> 2019;7(4):156. doi:10.3390/pharmacy7040156</li> <li>Holmes GM, Pink GH. Adoption and Perceived Effectiveness of Financial Improvement Strategies in Critical Access Hospitals. <i>J Rural Health.</i> 2012;28(1):92-100. doi:10.1111/j.1748-0361.2011.00368.x</li> <li>Kirk A, Holmes GM, Pink GH. Achieving Benchmark Financial Performance in CAHs. <i>Healthc Financ Manage.</i> Published online April 2012:116-122.</li> </ul>



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<p><b>Technology adoption</b></p>	<ul style="list-style-type: none"> <li>• Wakefield DS, Ward MM, Loes JL, O'Brien J, Sperry L. Implementation of a Telepharmacy Service to Provide Round-the-Clock Medication Order Review by Pharmacists. <i>Am J Health Syst Pharm.</i> 2010;67(23):2052-2057. doi:10.2146/ajhp090643</li> <li>• Feder JL. Charting A Life-and-Health Cycle and Expanded Primary Care Options for Patients in Wisconsin. <i>Health Aff (Millwood).</i> 2011;30(3):387-389. doi:10.1377/hlthaff.2011.0062</li> <li>• Aguilar A. Hospital execs innovate to overcome uncertainty. <i>Mod Healthc.</i> 2017;47(29):36. Accessed April 9, 2025. <a href="https://www.proquest.com/docview/1920413121?accountid=14244&amp;parentSessionId=VgS91Tv%2B1XHQ8VuH8Pz2f51VL3HdDS2S6C6t%2BavEngk%3D&amp;parentSessionId=VnmCVG%2FmZl-dOJl%2BtQpfzD47YZjRqCR0QSIepHU2CFyk%3D">https://www.proquest.com/docview/1920413121?accountid=14244&amp;parentSessionId=VgS91Tv%2B1XHQ8VuH8Pz2f51VL3HdDS2S6C6t%2BavEngk%3D&amp;parentSessionId=VnmCVG%2FmZl-dOJl%2BtQpfzD47YZjRqCR0QSIepHU2CFyk%3D</a></li> <li>• Haque SN, DeStefano S, Banger A, Rutledge R, Romaine M. Factors Influencing Telehealth Implementation and Use in Frontier Critical Access Hospitals: Qualitative Study. <i>JMIR Form Res.</i> 2021;5(5):e24118. doi:10.2196/24118</li> <li>• Johnson N, Murphy A, McNeese N, Reddy M, Purao S. A Survey of Rural Hospitals' Perspectives on Health Information Technology Outsourcing. <i>AMIA Annu Symp Proc.</i> 2013;2013:732-741. Accessed April 9, 2025. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3900214/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3900214/</a></li> <li>• Mills TR, Vavroch J, Bahensky JA, Ward MM. Electronic Medical Record Systems In Critical Access Hospitals: Leadership Perspectives on Anticipated and Realized Benefits. <i>Perspect Health Inf Manag.</i> 2010;7(Spring):1c.</li> <li>• MacKinney AC, Ward MM, Ullrich F, Ayyagari P, Bell AL, Mueller KJ. The Business Case for Tele-emergency. <i>Telemed E-Health.</i> 2015;21(12):1005-1011. doi:10.1089/tmj.2014.0241</li> <li>• Reddy MC, Purao S, Kelly M. Developing IT Infrastructure for Rural Hospitals: A Case Study of Benefits and Challenges of Hospital-to-Hospital Partnerships. <i>J Am Med Inform Assoc.</i> 2008;15(4):554-558. doi:10.1197/jamia.M2676</li> <li>• Bahensky J, Ward MM, Nyarko K, Li P. HIT Implementation in Critical Access Hospitals: Extent of Implementation and Business Strategies Supporting IT Use. <i>J Med Syst.</i> 2009;35:599-607.</li> <li>• Williams D, Simpson AN, King K, et al. Do Hospitals Providing Telehealth in Emergency Departments Have Lower Emergency Department Costs? <i>Telemed E-Health.</i> 2021;27(9):1011-1020. doi:10.1089/tmj.2020.0349</li> <li>• Morrison T, Weller J, Edelstein M. Robotics in Action. <i>HFM Mag.</i> Published September 2022.</li> </ul>
<p><b>Other strategies</b></p>	<ul style="list-style-type: none"> <li>• Butcher L. Case study: Wisconsin hospital embraces NPs as hospitalists   AHA Trustee Services. AHA Trustee Services. 2014. Accessed April 9, 2025. <a href="https://trustees.aha.org/articles/1243-wisconsin-hospital-embraces-nps-as-hospitalists">https://trustees.aha.org/articles/1243-wisconsin-hospital-embraces-nps-as-hospitalists</a></li> <li>• Sen Gupta TK, Murray RB, Beaton NS, Farlow DJ, Jukka CB, Coventry NL. A tale of three hospitals: solving learning and workforce needs together. <i>Med J Aust.</i> 2009;191(2):105-109. doi:10.5694/j.1326-5377.2009.tb02705.x</li> <li>• Wilson B. Financing to meet community needs a guide for small hospitals: obtaining financing for capital projects may seem daunting today if you are the financial leader of a small hospital, but standing still is no option. The encouraging word is, you do not have to. <i>Healthc Financ Manage.</i> 2009;63(3):74+. Accessed January 6, 2025. <a href="https://link.gale.com/apps/doc/A202487742/AONE?u=anon~62a02ca4&amp;sid=-googleScholar&amp;xid=2eb5bd21">https://link.gale.com/apps/doc/A202487742/AONE?u=anon~62a02ca4&amp;sid=-googleScholar&amp;xid=2eb5bd21</a></li> <li>• Elrod JK, Fortenberry JL. The hub-and-spoke organization design revisited: a lifeline for rural hospitals. <i>BMC Health Serv Res.</i> 2017;17(S4):795. doi:10.1186/s12913-017-2755-5</li> <li>• Karim SA, Pink GH, Reiter KL, Holmes GM, Jones CB, Woodard EK. The Effect of the Magnet Recognition Signal on Hospital Financial Performance. <i>J Healthc Manag.</i> 2018;63(6):e131-e146. doi:10.1097/JHM-D-17-00215</li> <li>• Fogel L, Watt J. 10 Steps to improve CAH financial performance. <i>Healthc Financ Manage.</i> 2007;61(5):6. Accessed April 8, 2025. <a href="https://go.gale.com/ps/i.do?id=GALE%7CA163394408&amp;sid=googleScholar&amp;v=2.1&amp;it=r&amp;linkaccess=abs&amp;issn=07350732&amp;p=AONE&amp;sw=w">https://go.gale.com/ps/i.do?id=GALE%7CA163394408&amp;sid=googleScholar&amp;v=2.1&amp;it=r&amp;linkaccess=abs&amp;issn=07350732&amp;p=AONE&amp;sw=w</a></li> <li>• KKarim SA, Holmes GM, Pink GH. The Effect of Surgery on the Profitability of Rural Hospitals. <i>The Journal of Health Care Finance.</i> Spring 2015. Accessed 12/16/2024, <a href="https://www.healthfinancejournal.com/-junland/index_php/johcf/article/view/30">https://www.healthfinancejournal.com/-junland/index_php/johcf/article/view/30</a></li> <li>• Spetz J. Information Technology Implementation in a Rural Hospital: A Cautionary Tale: <i>J Healthc Manag.</i> 2009;54(5):337-347. doi:10.1097/00115514-200909000-00009</li> </ul>



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