Inpatient Pediatric Care and Clinician Workforce in Wisconsin: The State of the State

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ABSTRACT

Introduction: Availability of inpatient pediatric services declined across the United States from 2008 through 2018, with rural areas experiencing steepest declines. Despite the movement of pediatric care to children's centers, most children are still cared for in community hospitals nationally. Assessing the availability and providers of inpatient pediatric care in Wisconsin is an important step in ensuring the health care needs of children in the state continue to be met.

Methods: A cross-sectional survey was distributed to Wisconsin hospitals to determine pediatric services and physician workforce. The response rate was 130/138 (94%), including 56/58 (97%) critical access hospitals. Results of specific inpatient pediatric subdivisions were analyzed by descriptive statistics.

Results: Hospitals that provide inpatient newborn care are mostly staffed by pediatricians and family physicians, while critical access hospitals are staffed by family physicians. Hospitals with neonatal intensive care units are staffed by neonatologists, with telemedicine utilized in critical access hospitals. Hospitals with general pediatric admissions are staffed by pediatricians or family physicians, while critical access hospitals are staffed by family physicians. Hospitals with pediatric intensive care units are staffed by pediatric intensivists.

Conclusions: Despite workforce disparities and shortages, hospitals across Wisconsin, including many critical access hospitals, continue to provide inpatient pediatric services. Family physicians play a major role in the pediatric health care delivery in Wisconsin hospitals. Robust inpatient pediatric training of family physicians may enable rural health authorities to continue addressing the gaps that persist in inpatient pediatric care accessibility.

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INTRODUCTION

A retrospective study reviewing the availability of pediatric inpatient services in the United States from 2008 through 2018 showed an 11.8% decrease in pediatric inpatient unit beds, with rural areas experiencing a steeper decline than urban areas.[1] Hospitals in Wisconsin experienced the second greatest decline in the number of pediatric beds, behind Wyoming.[1] Another retrospective study from 2008 through 2016 determined that the capability for definitive hospital care for children at acute care hospitals had declined across the United States, especially at hospitals with low pediatric volumes and those serving rural populations. In addition, emergency department transfers for children increased at all acute care hospitals, with the exception of tertiary pediatric institutions.[2]

In Wisconsin, there are currently 58 critical access hospitals (CAH), which are rural acute care facilities designed by the Centers for Medicare and Medicaid Services (CMS) to improve access to essential health care.[3,4] Pilkey et al found that CAHs see few children and are challenged to remain proficient and capable of caring for pediatric patients.[5] However, prior studies continue to show that 50% to 70% of children are cared for in community and acute care hospitals nationwide, rather than tertiary children's centers.[6] It is unclear what the current state and accessibility of inpatient pediatric care is in Wisconsin, especially in its rural hospitals. As the national trends show declining inpatient pediatric capabilities at acute care

Published online May 25, 2023.

and community hospitals, further quantification of inpatient pediatric care in Wisconsin—particularly in rural areas—is necessary.

The newest proposed residency training guidelines from the Family Medicine Accreditation Council for Graduate Medical Education Review and Recognition Committee would exclude requirements for family medicine residency faculty to provide inpatient pediatric care.[7] However, family physicians historically have provided pediatric care in a variety of settings, including inpatient care. As of 2021, there are 110 areas in Wisconsin—both urban and rural—that have been designated as total primary care Health Professional Shortage Areas (HPSA), which include the specialties of general practice, family medicine, general internal medicine, pediatrics, and geriatrics.[8] A 2019 report by the Wisconsin Department of Health Services (DHS) notes that of Wisconsin's 72 counties, 33 were experiencing a shortage of primary care physicians; those counties with a higher proportion of rural areas were at greater risk of a severe shortage.[9]

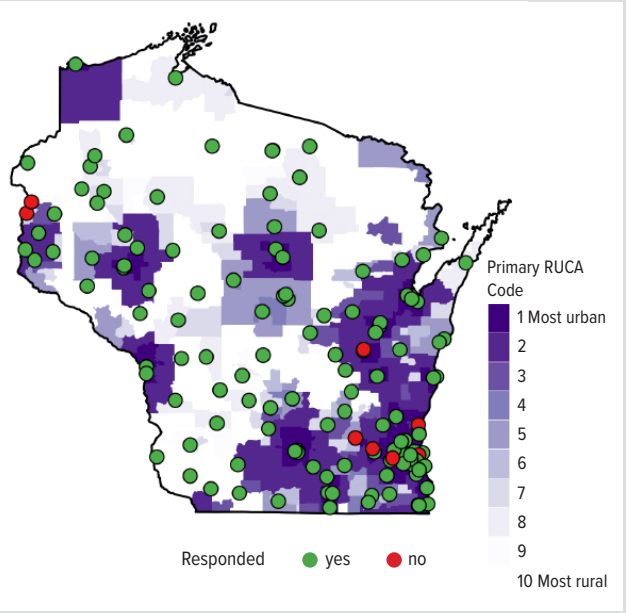
Approximately 24% of the Wisconsin population is considered rural, designated by an area with a population of less than 2,500 and 25 miles or more away from a population of greater than 50,000.[10] A 2021 report from the Wisconsin Council on Medical Education and Workforce demonstrated a longstanding maldistribution of the health care workforce, noting that 93% of physicians practice in urban areas, leaving 7% of physicians to cover Wisconsin's rural population.[11] The results of this study will help to better understand some of those needs and future directions of inpatient pediatric care across the state.

METHODS

With input from stakeholders, a cross-sectional Qualtrics electronic survey was designed and distributed to contacts at Wisconsin hospitals designated as general medical and surgical care or as a CAH from June through July 2022 (Figure 1). Hospitals that focused solely on rehabilitation, surgical, psychiatric, long-term acute, or veteran affairs were excluded. Nonresponding hospitals were contacted by phone and offered the opportunity to complete the survey via telephone interview. Four main categories of inpatient pediatric care were used to cover all types of pediatric care in hospitals, including inpatient newborns, inpatient pediatrics, neonatal intensive care unit (NICU), and pediatric intensive care unit (PICU). Options for physician management of pediatric care included pediatrician, family physician, pediatric hospitalist, neonatologist, pediatric intensivist, and "other" (Figure 2). Survey respondents also were asked open-ended questions about recent changes in their hospital system in the past 5 years or goals regarding inpatient pediatrics in the next 5 years.

Complete responses were received from 130 of 138 (94%) of Wisconsin's general medical surgical hospitals and 56 of 58 (97%) of Wisconsin hospitals designated as CAHs (Figure 1). Responses came from a variety of personnel, including chief nursing officers, chief medical officers, chiefs of staff, nurse managers, physicians, and other staff members. In addition to survey responses, hospital informatics data from DHS and the WHA Information Center was used to verify responses and supplement the information collected.[12] CAH designation was used in lieu of hospital rurality. Maps and figures were made using R version 4.1.3 (2022-03-10) and formatted using rural urban commuting area codes. Further data were analyzed using descriptive statistics. This study was not deemed to constitute human subject research and, therefore, was not subject to institutional review board review.

Figure 1. Map of Wisconsin With Hospitals Contacted for Survey Distribution



Abbreviations: RUCA, rural urban commuting area.

RESULTS

Inpatient Newborn Services

Survey results showed 87 (64%) Wisconsin hospitals currently provide inpatient newborn care, defined as the care of a newborn after delivery (Figure 3A). Of those hospitals, 28 (32%) are designated as CAHs. Hospitals providing inpatient newborn care were widespread throughout Wisconsin, with higher density in more urban areas.

Of the hospitals that provide inpatient newborn care, more than half utilize pediatricians (63%) or family physicians (55%) (Figure 4A). Other clinicians include neonatologists (8%), pediatric hospitalists (8%), nurse midwives (5%), neonatal nurse practitioners (3%), newborn hospitalists (2%), and telemedicine neonatologists (1%). Of note, 10 hospitals (11%) either did not report which clinicians provide inpatient newborn care or did not fill out the survey.

Of the CAHs, over three-fourths (79%) utilize family physicians for inpatient newborn care. Other less common clinicians

Published online May 25, 2023.

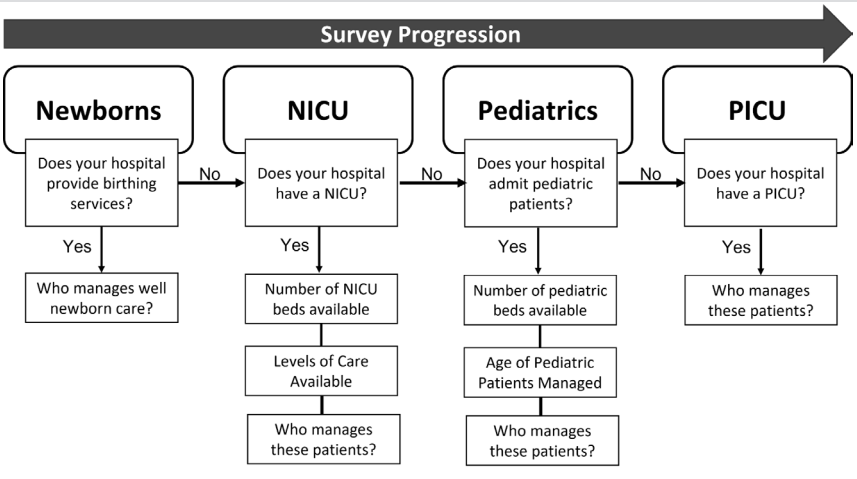
at CAHs include pediatricians (25%), nurse midwives (11%), telemedicine neonatologists (3%), and neonatal nurse practitioners (3%). These findings suggest that family physicians are the most common type of clinicians for inpatient newborn care in rural Wisconsin hospitals, while both pediatricians and family physicians comprise the majority who engage in inpatient newborn care at hospitals throughout Wisconsin.

Inpatient Pediatric Services

Fifty-six (41%) Wisconsin hospitals currently provide inpatient pediatric care, defined as admission of pediatric patients between the ages of 0-17 years old who do not need intensive care (Figure 3B). Of those hospitals, 21 (38%) are designated as CAHs. At all Wisconsin hospitals that admit pediatric patients, the median number of pediatric beds is 8, with the highest number of beds being 250. At the CAHs, the average number of pediatric beds is 7. Of the hospitals that admit pediatric patients, 46% do not have designated pediatric beds and rather admit pediatric patients to their general medical units. Overall, hospitals providing inpatient pediatric care are also widespread throughout Wisconsin but less dense than hospitals providing inpatient newborn care.

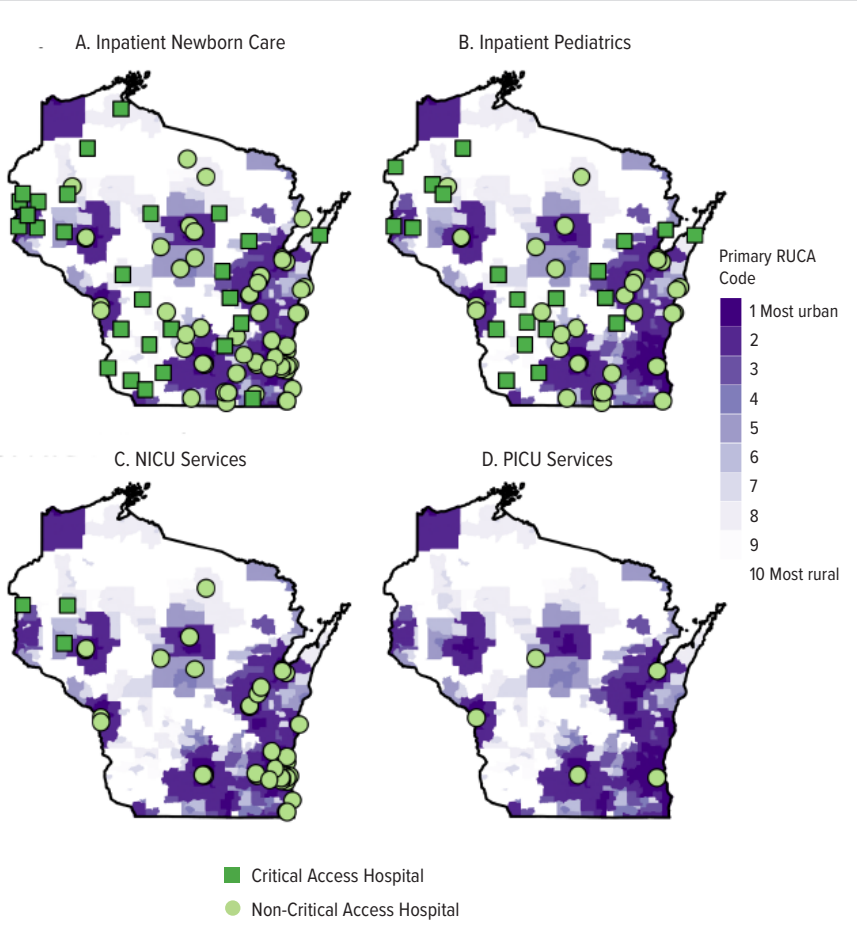
Of all Wisconsin hospitals that care for inpatient pediatric patients, more than half utilize pediatricians (59%) or family physicians (59%) (Figure 4B). Other clinicians include pediatric hospitalists (18%), hospitalists (13%), telemedicine pediatricians (4%), subspecialty physicians (2%), and acute care nurse practitioners (2%). Of the CAHs, almost three-fourths (71%) utilized family physicians for inpatient pediatric care. Other less common clinicians at CAHs include pediatricians (29%), hospitalists (24%), and telemedicine pediatricians (10%). One hospital did not report which clinicians provide inpatient newborn care. These findings suggest that family physicians are the most common type of clinician for inpatient pediatric care in rural Wisconsin hospitals, while

Figure 2. Electronic Survey Structure of Inpatient Newborn, NICU, Inpatient Pediatrics, and PICU Hospital Services



Abbreviations: NICU, neonatal intensive care unit; PICU, pediatric intensive care unit.
Respondents answered 1 to 3 additional questions if answered Yes, or move to the next category if selected No.

Figure 3. Maps of Wisconsin Hospitals that Provide Services of (A) Inpatient Newborn, (B) Inpatient Pediatric, (C) NICU, and (D) PICU Services



Abbreviations: NICU, neonatal intensive care unit; PICU, pediatric intensive care unit.

Published online May 25, 2023.

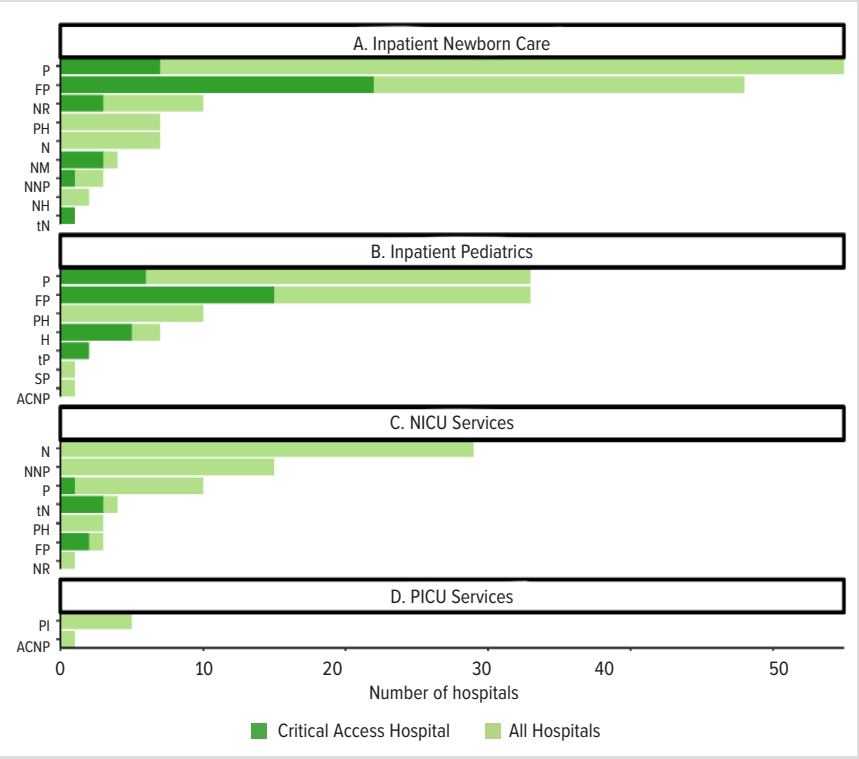
both pediatricians and family physicians comprise the majority who engage in inpatient pediatric care at Wisconsin hospitals.

NICU Services

Forty-one (30%) Wisconsin hospitals currently have a NICU, varying from level 1 (lowest level of care need) to level 4 (highest level of care need) (Figure 3C). There are 6 level 1 NICUs, with an average of 2 beds available; 19 level 2 NICUs, with an average of 8 beds; 14 level 3 NICUs, with an average of 26 beds; and 2 level 4 NICUs, with an average of 75 beds. Of the Wisconsin hospitals with NICUs, 3 (7%) are designated as CAHs and all are level 1. Overall, hospitals with NICUs are clustered around more urban areas in Wisconsin, with the few designated NICUs in CAHs in the northwestern region of the state.

Of the 41 hospitals with NICUs, almost three-fourths utilize neonatologists (71%) (Figure 4C). Other clinicians include neonatal nurse practitioners (37%), pediatricians (24%), telemedicine neonatologists (10%), family physicians (7%), and pediatric hospitalists (7%). Of the CAHs, all (100%) utilize telemedicine neonatologists to care for neonates in NICUs. Other clinicians at CAHs include family physicians (67%) and pediatricians (33%). These findings suggest that neonatologists comprise the majority who care for neonates in Wisconsin NICUs, with telemedicine neonatologists being utilized to cover NICUs in CAHs.

Figure 4. Inpatient Pediatric Workforce of Wisconsin Hospitals That Provide (A) Inpatient Newborn, (B) Inpatient Pediatric, (C) NICU, and (D) PICU Services



Abbreviations: CAH, critical access hospital; NICU, neonatal intensive vare unit; PICU, pediatric intensive care unit; ACNP, acute care nurse practitioner; FP, gamily physician; H, hospitalist; P, pediatrician; PH, pediatric hospitalist; PI, pediatric intensivist; N, neonatologist; NH, newborn hospitalist; NNP, neonatal nurse practitioner; NM, nurse midwife; SP, subspecialty physician; tN, telemedicine neonatologist; tP, telemedicine pediatrician; NP, not reported.

PICU Services

Five (4%) Wisconsin hospitals currently have a PICU, as designated by guidelines from the American Academy of Pediatrics (Figure 3D). Of these hospitals, 3 are designated as tertiary children's centers and none are CAHs. Hospitals with PICUs are clustered around more urban areas in central and southern Wisconsin; and all (100%) utilize pediatric intensivists and 1 (20%) utilizes pediatric acute care nurse practitioners (Figure 4D).

Overview of Inpatient Pediatric Services

Of Wisconsin's 72 counties, 5 have at least 1 hospital with all 4 pediatric services, including inpatient newborn, inpatient pediatrics, NICU, and PICU (Figure 5). Eight counties have hospitals that provide inpatient newborn, inpatient pediatrics, and NICU services. Eighteen counties have hospitals with inpatient newborn and inpatient pediatrics services, and 7 counties have hospitals with inpatient newborn and NICU services. Eight counties have hospitals that provide inpatient newborn services only, and 3 counties have hospitals that provide inpatient pediatrics only. Notably, there are 23 counties with no type of pediatric services; many of these counties have a higher density of rural areas.

Information also was gathered on changes to the volume of inpatient pediatrics admissions and workforce at hospitals in Wisconsin over the past 5 years, with 37 non-CAH respondents and 22 CAH respondents. At non-CAHs, 7 hospitals closed their general inpatient pediatric units or services, 2 hospitals closed their inpatient newborn services, 41% of respondents now transfer all of their pediatric patients to different hospitals, and 24% continue to admit low acuity pediatric patients but transfer all others that need a higher level of care. Of the non-CAH respondents, 17% noted that shortages of nurses or providers or insufficient staff experience limit their ability to provide inpatient services. Three non-CAHs added an advanced practice practitioner (APPs) program, 1 added a family medicine hospitalist program, and 1 closed its pediatric hospitalist program.

Among CAHs, 1 closed its general inpatient pediatric services, 5 closed their inpatient newborn services, 32% of respondents

Published online May 25, 2023.

now transfer all of their pediatric patients to a different hospital, and 27% admit low acuity pediatric patients but transfer all others. One CAH added an APP program, 4 added telemedicine neonatologist or telemedicine pediatrician programs, and 1 added a family medicine hospitalist program. Many hospitals throughout Wisconsin—both CAH and non-CAH—noted that the COVID-19 pandemic limited their capability for pediatric admission.

Further information was gathered on hospitals' goals regarding their inpatient pediatric services in the next 5 to 10 years. Two hospitals indicated plans to expand their inpatient newborn, general inpatient pediatric, and PICU services, while 5 hospitals plan to expand their NICU services. Two hospitals plan to close their inpatient pediatric services; 2 hospitals hope to add APP programs; and 52 CAHs hope to add a pediatric hospitalist program or telemedicine neonatologists.

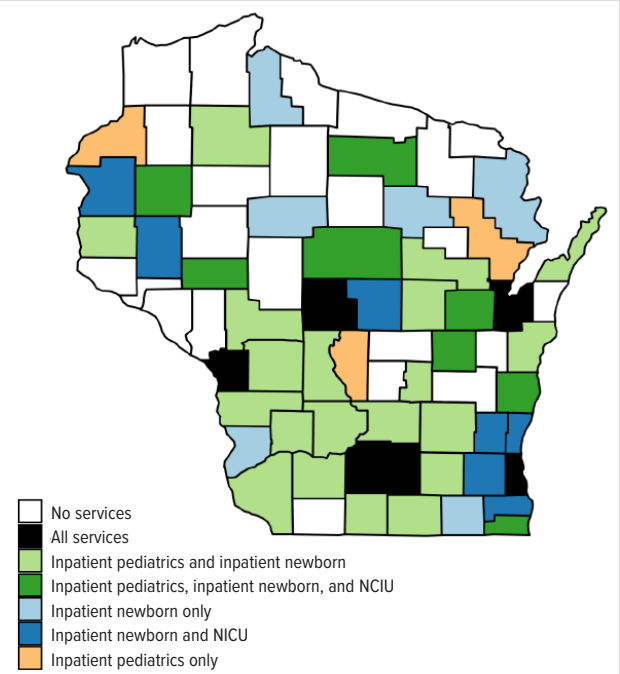
DISCUSSION

As inpatient pediatric availability has been declining nationwide, the current state of inpatient pediatric care in Wisconsin has been unclear. Wisconsin's rural areas have been at risk of or are already experiencing shortages of family physicians and pediatricians, compounding the state's historic physician workforce disparities in urban versus rural areas.[8,9] Despite these workforce disparities and shortages, some CAHs in Wisconsin continue to provide pediatric care, although many have low pediatric census and inadequate staffing, and some have closed their services altogether.

A 2018 study by the Wisconsin Office of Rural Health determined that 53% of CAHs in Wisconsin delivered babies, defined as having a stable number of births for the past 5 years.[13] The current cross-sectional study has now shown that 48% of the CAHs in Wisconsin provide inpatient newborn care and 32% provide inpatient pediatric care. Therefore, in the past 4 years, there may have been an approximate 5% decline in the number of CAHs that can provide inpatient newborn care. No recent study for comparison of inpatient pediatrics in Wisconsin could be found. Notably, several counties do not have any type of inpatient pediatric services, which may increase driving times to care and, therefore, limit accessibility for those who live in these regions. Further study is needed to help rural health authorities address the gaps that persist in inpatient pediatric care accessibility.

With Wisconsin mirroring the nationwide decline in inpatient pediatric care availability in rural areas, it remains important for both pediatric and family medicine residency training programs to provide a robust foundation in inpatient care. Both pediatricians and family physicians continue to play a major role in the pediatric health care delivery in Wisconsin hospitals, with a significant portion of rural Wisconsin hospitals utilizing primarily family physicians. Therefore, family medicine programs that have faculty providing inpatient pediatric care should be encouraged to continue providing this care, as residents may be more likely to continue practicing inpatient pediatric care if they have seen their faculty model this.

Figure 5. Wisconsin Counties With Hospitals That Provide Inpatient Pediatric Services



Abbreviations: NICU, neonatal intensive care unit; PICU, pediatric intensive care unit.

Nationwide, inpatient coverage by pediatric hospitalists is becoming more common, even in smaller community hospitals.[14] Early career fellowship-trained pediatric hospitalists have self-reported a higher level of competency in core areas compared to their nonfellowship-trained peers.[15] Our findings suggest that non-CAHs in Wisconsin are starting to utilize pediatric hospitalists for inpatient pediatric services but to a much lesser extent than other specialties. As this field continues to develop and as the number of fellowship-trained physicians increases, there may be a shift in the inpatient pediatric physician workforce across the state in the future.

Another emerging field in medicine is the use of telemedicine for remote health care services without the need for direct contact with the patient. With the COVID-19 pandemic, telemedicine has been expanding rapidly across the country, with some physicians and hospital systems considering integrating telemedicine into their practice long-term.[16] In a 2021 study, neonatal telemedicine was shown to improve access to care and improve patient outcomes, especially in rural hospitals.[17] At both CAHs and non-CAHs across the state, telemedicine neonatologists and telemedicine pediatricians have been utilized for inpatient pediatric care.

There has been a recent push for regionalization of inpatient

Published online May 25, 2023.

pediatric care, with children's centers now having a higher mean volume of inpatient pediatric patients than general hospitals.[6] Also nationwide, transfers out of community hospital emergency departments to other hospitals that have the necessary level of inpatient pediatric capabilities and services also have increased, possibly contributing to the higher volume of patients seen at children's centers.[2] However, throughout the COVID-19 pandemic, many pediatric centers stated that they were "at or near capacity" and expressed concern they would not have enough beds or staff for quality care of their pediatric patients.[18] New studies have shown that telemedicine intensivists may have the potential to improve triage of pediatric patients and reduce pediatric emergency department transfers, especially in rural hospitals.[19] However, there are no known current telemedicine intensivists on staff in Wisconsin for inpatient pediatric care. There is opportunity for future implementation at some hospitals across the state to increase access to inpatient pediatric services, as admitting physicians may become more comfortable managing pediatric patients with a consistently higher volume of patients.

Study Limitations

The study was limited to a point-in-time analysis of Wisconsin hospitals and did not gather quantitative data for metrics on the definitive capability for each hospital to admit pediatric patients. Additionally, proportions of inpatient pediatric clinicians at each hospital (eg, number of family physician vs pediatricians on staff) were not collected in this study and, therefore, do not reflect the total number of different clinicians at rural versus urban hospitals. A future study collecting this data would be beneficial to address specific gaps in the rural physician workforce. In addition, patient and provider satisfaction and quality metrics were not assessed in this study. Best practices in balancing competing demands of inpatient and outpatient coverage for pediatricians and family physicians who practice in both settings, ideal compensations structures, and measures to avoid burnout also were not explored. The generalizability of these findings to other US states is limited, as Wisconsin differs in its proportion of rural areas and population and health systems. However, primary care physician shortages are happening nationwide, with projected shortages between 17,800 and 48,000 family medicine and general pediatric physicians.[20] Additionally, states surrounding Wisconsin have similar rural populations from 20.0% to 39.9%, including Minnesota, Michigan, and Iowa; therefore, similar trends to Wisconsin inpatient pediatric accessibility and workforce may be found in future studies in similar states.[21]

CONCLUSIONS

Inpatient pediatrics availability and capability for definitive care has been declining nationwide, including in Wisconsin. Physician shortages and rural workforce disparities in family practice and pediatrics have challenged rural hospitals in providing inpatient pediatric care. Family physicians and pediatricians are utilized for inpatient pediatric care in most of the CAHs in Wisconsin; therefore, residency programs should continue providing program faculty who can train in inpatient pediatric care. Despite workforce shortages, Wisconsin hospitals, including CAHs, continue to provide inpatient pediatric care to the rural population, although some have noted challenges with physician staffing and limited pediatric census to continue admitting pediatric patients. Notably, many Wisconsin counties do not have hospitals with inpatient pediatric care services available. Further investigation is needed to address these gaps in inpatient pediatric care accessibility.

Financial Disclosures: None declared.

Funding/Support: This project was supported through the Brillman Grant of the UW Department of Family Medicine and Community Health (UWDFMCH). The project was also supported by the Clinical and Translational Science Award (CTSA) program, through the NIH National Center for Advancing Translational Sciences (NCATS), grant UL1TR002373. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Acknowledgements: The authors wish to thank the staff of the University of Wisconsin Carbone Cancer Center (UWCCC) Biostatistics Shared Resource for their valuable contributions to this research. Shared research services at the UWCCC are supported by Cancer Center Support Grant P30 CA014520. This project would not have been possible without the support of stakeholders in Wisconsin, including Erica Kane, Joanna O'Donnell, HERC Coordinators, and the numerous individuals who responded to our survey.

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Published online May 25, 2023.