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Public Insurance Status Negatively Affects Access to Care in Pediatric Patients With Meniscal Injury

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Background: Non- and underinsured individuals experience poor access to care and treatment delays. Meniscal injury is a common reason for surgical intervention in the pediatric population, and delays in care can lead to progression of the tear and other associated problems.

Purpose: To investigate the impact of insurance status on access to care and severity of meniscal injury in the pediatric population.

Study Design: Cohort study; Level of evidence, 3.

Methods: Enrolled in this study were 49 patients receiving care for a meniscal injury between 2016 and 2018 from a safety-net medical system that does not prioritize patients based on insurance status. The patients were stratified into those publicly insured and those privately insured. Access to care was measured as wait time to various points of care: initial injury to clinic, injury to magnetic resonance imaging (MRI), injury to surgery, clinic to MRI, clinic to surgery, and MRI to surgery. The severity of the meniscal tear was measured by findings at the time of arthroscopy, including the type of tear identified, surgery performed, and cartilage injury.

Results: Publicly insured patients waited a mean 230 days longer (347 vs 117 days; $P < .01$) to undergo surgery after injury compared with privately insured patients. The mean wait times in all categories except time from MRI to surgery were significantly longer for publicly insured patients, including injury to clinic (212 vs 73 days; $P < .01$), injury to MRI (260 vs 28 days; $P < .001$), injury to surgery (347 vs 117 days; $P < .01$), clinic to MRI (36 vs 3.9 days; $P < .001$), and clinic to surgery (136 vs 44 days; $P < .01$). Neither increased wait times nor insurance status were associated with greater surgical repair rate, severe tear type, or cartilage injury.

Conclusion: Publicly insured pediatric patients waited significantly longer for a diagnosis of meniscal tear compared with privately insured patients, even in a safety-net setting. These delays were not associated with greater tear severity or cartilage changes. Providers in all models of care should recognize that insurance status and the socioeconomic factors it represents prevent publicly insured patients from timely diagnostic points of care and strive to minimize the resulting delayed return to normal activity as well as the potential long-term clinical effects thereof.

Keywords: meniscus; pediatric sports; insurance status; health care access

Medicaid and the Children's Health Insurance Program (CHIP) are the largest health insurance providers for children in the United States, offering coverage for 35.1 million children from disabled or low-income households across the 49 states that reported enrollment data in December 2019.^{12,23} Despite expansion of government-funded health care coverage, the number of providers accepting Medicaid/CHIP is decreasing; as such, health care coverage does not necessarily equate to health care access.^{12-14,19,21,25,37} Medicaid/CHIP pediatric patients have been shown to wait

40 days longer for an appointment than those with private insurance,⁸ which in orthopaedics has translated to more severe injury at time of surgery.^{24,27,34}

Meniscal tears account for one of the most common injuries among pediatric athletes.⁵⁰ The meniscus is integral to activity in children, playing a vital role in load bearing, load distribution, and overall knee stability,¹⁴ with tears leading to significant long-term clinical effects. Approximately half of patients develop knee osteoarthritis within 10 to 20 years of meniscal injury, and delays in care have been linked to inhibited joint mobility, tear expansion, irreparability, and knee degeneration.^{38,40} In contrast, early meniscal repair is associated with improved surgical outcomes, lower risk of osteoarthritis and repeat tear, and higher rates of return to

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sport.^{1,14} Therefore, it is important to understand barriers to timely management of meniscal tear in children to prevent long-term morbidity.

Although researchers have examined the effect of insurance status on a number of orthopaedic interventions, pediatric meniscal injury has not been one of them. Because of the high demands on children's knees and the potential consequences of arthritic changes at a young age, understanding the relationship between insurance status and time to meniscal care in the pediatric population is essential. This study aimed to determine the extent to which publicly and privately insured pediatric patients with meniscal injury differ in their injury severity and times to various points of care at a safety-net hospital; we expected to find that patients with public insurance experience both greater delays in care and greater injury severity.

METHODS

Participants

Institutional review board approval was obtained for this retrospective review of pediatric patients treated at a safety-net medical system from 2016 to 2018. Patients younger than 18 years of age were included in the study if they had evidence of an isolated meniscal injury on magnetic resonance imaging (MRI) and underwent surgical intervention for their tear. Patients who received nonsurgical treatment or initial treatment for meniscal injury at another institution were excluded.

Patient characteristics included insurance status (public or private), date of injury, date of MRI, date of initial evaluation at an orthopaedic clinic, and date of surgery. The source of referral (primary care provider, external orthopaedist, etc) was not accessible and therefore not included. Patients were stratified into public and private insurance groups. Our safety-net hospital automatically enrolls uninsured patients in public insurance; therefore, patients without insurance who received care were placed in the publicly insured group. A review of the patient's clinic visit, imaging, and operative notes was performed to determine the presence of medial and/or lateral meniscal injuries. Meniscal tears were classified as either nonsevere or severe: Nonsevere tears included horizontal, vertical, radial, degenerative, intrasubstance, or undefined tears, while severe tears included bucket handle, complex, or transecting nonsevere tears. The type of surgery performed was categorized as repair or nonrepair (debridement, saucerization, or partial meniscectomy). Cartilage injury at the

time of operation was recorded as present or absent, and the severity of cartilage injury was determined by Outerbridge grade reported in the surgical notes. Repeat knee procedures were recorded as binary variables. Cases of discoid meniscus were not analyzed, and no other independent conditions, such as anterior cruciate ligament (ACL) or medial patellofemoral ligament tears, were present.

Statistical Analysis

The Wilcoxon rank-sum test for continuous variables was used to determine statistical significance in time from injury to clinic presentation, injury to diagnostic MRI, injury to surgery, clinic presentation to MRI, clinic presentation to surgery, and MRI to surgery between publicly and privately insured patients. The Fisher exact test for dichotomous variables was used to determine statistically significant differences in type of surgery performed (repair vs nonrepair), as well as the presence and grade of cartilage injury between publicly insured and privately insured patients. Statistical significance was defined as $P < .05$.

RESULTS

Patient Characteristics

A total of 83 patients were identified in a database search for isolated pediatric meniscal injuries between 2016 and 2018 based on diagnosis documented in the medical record system. After review, 21 patients did not have MRI or operative evidence of meniscal injury and were excluded. Five patients were excluded for insufficient documentation of injury date (3 publicly insured; 2 privately insured), and an additional 8 patients were excluded from the calculations involving wait time from clinic to MRI and injury to MRI as they underwent imaging at outside institutions before their first patient presentation to our orthopaedic clinic (3 publicly insured; 5 privately insured). In the remaining 49 patients meeting inclusion criteria, the overall mean age was 16.1 years, and 61.2% were male. Of the total patients, 32 were publicly insured and 17 were privately insured (Table 1).

Time to Care

Patients with public insurance experienced significantly longer mean wait times to all points of care except MRI to surgery ($P = .09$) (Table 2), including injury to clinic (publicly insured, 212 ± 343 days vs privately insured, 73 ± 168

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Ethical approval for this study was obtained from the University of California, San Francisco (ref No. 267085).

TABLE 1
Patient and Meniscal Injury Characteristics

	Publicly Insured (n = 32)	Privately Insured (n = 17)	P Value
Mean age, y	16.4	15.6	.07
Male, %	68.8	47.1	.22
Surgery performed, n (%)			
Repair	21 (65.6)	7 (41.2)	.13
Nonrepair	11 (34.4)	10 (58.8)	.13
Tear type, n (%)			
Severe ^a	15 (46.9)	6 (35.3)	.55
Nonsevere ^b	17 (53.1)	11 (64.7)	.55
Presence of cartilage injury, n (%)	10 (31.3)	5 (29.4)	>.99
Mean Outerbridge grade	1.89	2	.69

^aSevere tears include bucket handle, complex, or transecting nonsevere tears.

^bNonsevere tears include horizontal, vertical, radial, degenerative, intrasubstance, or undefined tears.

days; $P < .01$), injury to MRI (260 ± 260 vs 28 ± 27 days; $P < .001$), injury to surgery (347 ± 466 vs 117 ± 179 days; $P < .01$), clinic to MRI (36 ± 48 vs 3.9 ± 5.9 days; $P < .001$), and clinic to surgery (136 ± 181 vs 44 ± 40 days; $P < .01$) (Figure 1).

Tear Severity

Compared with patients with private insurance, indicators of tear severity did not significantly differ between insurance groups. Incidence of surgical repair, severe tear pattern, and presence of cartilage injury at time of operation were nonsignificantly higher among patients with public insurance (65.6% vs 41.2%, $P = .13$; 46.9% vs 35.3%, $P = .55$; 31.3% vs 29.4%, $P > .99$) (Table 1), while publicly insured patients had a nonsignificantly lower average Outerbridge grade compared with privately insured patients (1.89 vs 2; $P = .69$). The proportion of patients with indicators of severe meniscal injury (surgical repair; tear classified as bucket handle, complex, or transecting; or the presence of cartilage injury at time of operation) was not correlated with increasing wait time (Figure 2). There were no complications of surgery reported, and three privately insured patients underwent repeat knee surgery for injuries unrelated to the meniscal tear analyzed.

DISCUSSION

The present study found that publicly insured pediatric patients with meniscal injury experienced significant delays in care, waiting a mean of 230 days longer than privately insured patients to undergo surgery from the time of injury. However, the safety-net nature of our hospital, which does not apportion care based on insurance status, suggests that it was not necessarily insurance status that affected wait times. Rather, delays in care pertained

TABLE 2
Comparison of Wait Times to Different Points of Care^a

Wait Time (days)	Publicly Insured		Privately Insured		P Value	95% CI of Mean Difference
	Mean ± SD	n	Mean ± SD	n		
Injury to surgery	347 ± 466	32	117 ± 179	17	<.01	31 to 204
Injury to MRI	260 ± 260	29	28 ± 27	12	<.001	31 to 201
Injury to clinic	212 ± 343	32	73 ± 168	17	<.01	9.0 to 154
Clinic to surgery	136 ± 181	32	44 ± 40	17	<.01	10 to 73
Clinic to MRI	36 ± 48	29	3.9 ± 5.9	12	<.001	5.0 to 30
MRI to surgery	109 ± 177	29	36 ± 137	12	.09	-2.0 to 43

^aBoldface P values indicate a statistically significant difference between public and private insurance ($P < .05$). MRI, magnetic resonance imaging.

specifically to points of diagnostic care: Patients with public insurance waited approximately five times longer to be evaluated at the clinic, and nine times longer thereafter to undergo MRI, but the delay from diagnosis to surgery for these patients was statistically equivalent to their privately insured counterparts. Interestingly, neither insurance status nor wait time was associated with severity of injury. Taken together, these findings suggest that the delays in diagnosis of meniscal tear for publicly insured pediatric patients had limited effect on injury severity and may not have stemmed from provider-related lags in treating identified meniscal tears, but rather from external barriers that were then reflected in insurance status.

Prolonged wait times and their effects on the underinsured are not specific to meniscal injury or orthopaedics in general. Studies show that patients with public insurance experience longer wait times and poorer health outcomes across medical specialties.^{2,5,8,17,19,26,28,30,31} Given that 45% of children 18 years or younger in the United States were uninsured or publicly insured in 2018,¹⁸ the potential impact of these discrepancies is substantial. It has been postulated that differences in provider reimbursement rates account for disparities in access to care^{4,13,19,22,33,36,39,46}; however, we found that lags persist at an insurance-blind institution, suggesting that factors outside the care system exist and preferentially affect publicly insured patients.

Our results echoed those of Khanna et al,²⁴ who found in an analogous study that the delays in care experienced by publicly insured patients at a safety-net hospital occurred before diagnosis of ACL tear. Therefore, we must consider factors that lend to patients and/or caretakers being unaware of the extent of the child's injury, unable to access care, and/or reticent to enter the system. Possible factors include low income, minority or immigrant status,

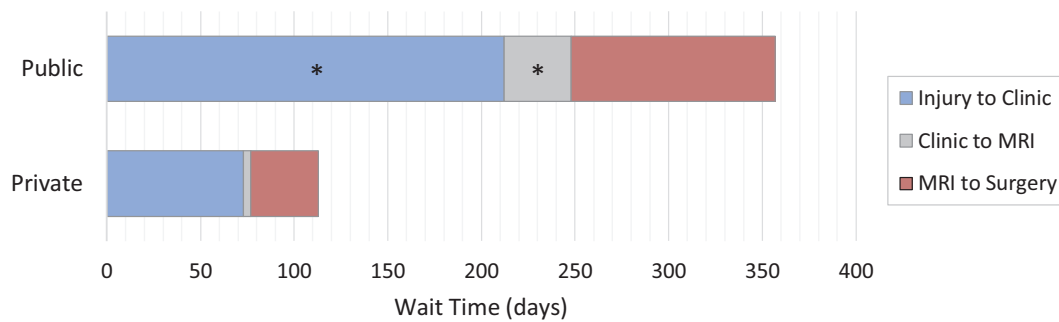


Figure 1. Differences in timeline of care. Comparison of wait time in days between publicly and privately insured patients. Patients with public insurance experienced significant delays in time from injury to clinic presentation and from clinic to magnetic resonance imaging (MRI), but they did not wait significantly longer for surgery after receiving a diagnosis of meniscal tear on MRI. *Statistically significant difference between public versus private insurance ($P < .05$).

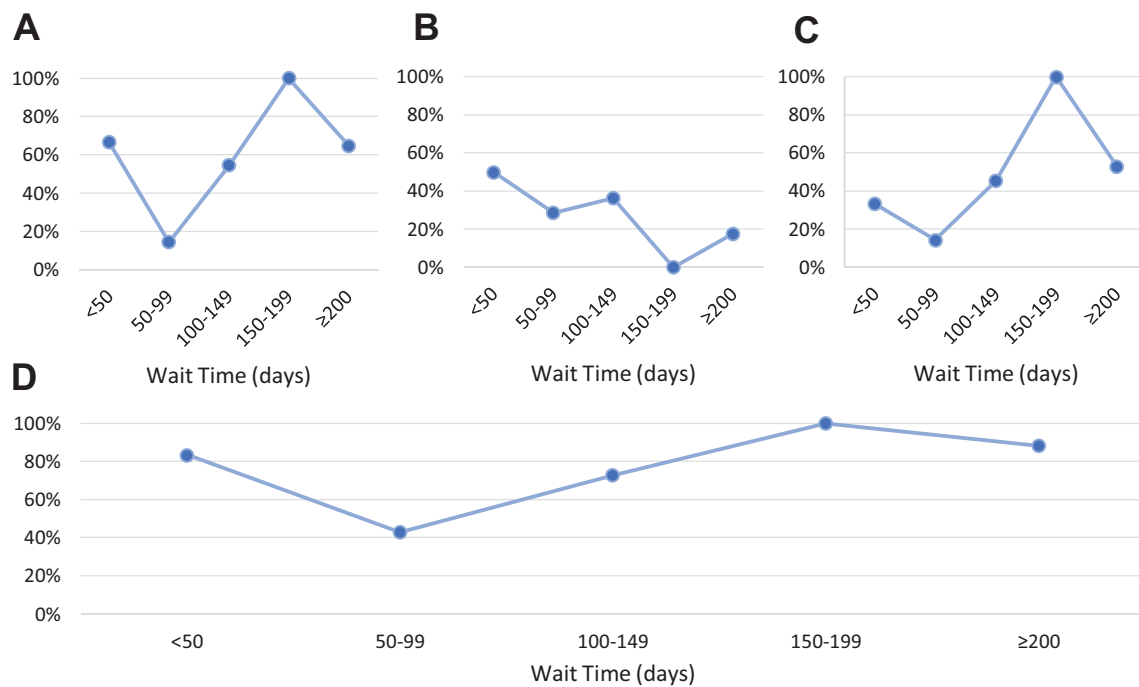


Figure 2. Relationship between wait time and proportion of total patients ($n = 49$) with an indicator of severe meniscal injury. Wait time was considered the number of days between injury and surgery. Indicators of severe meniscal injury included (A) tears requiring surgical repair rather than debridement, saucerization, or partial meniscectomy; (B) intraoperative findings of cartilage injury; and (C) evidence of bucket handle, complex, or transecting meniscal tear on magnetic resonance imaging. (D) The proportion of patients with any indicator of severe injury shown in relation to wait time.

language barriers, distrust or fear of the medical system, and lack of a usual source of care; each of these is shown to be more common in underinsured patients.²³

Children from low-income families are more likely to be underinsured because of their caretakers being unemployed, working for small firms or in industries with low employer-sponsored insurance (ESI) offer rates, or opting out of ESI because of ever-rising premiums.^{15,44} Low income also presents hurdles to children seeking orthopaedic care by limiting caretakers' ability to take time off work, procure or afford transportation and sibling child care, and

utilize limited social support.⁴⁵ In fact, poor and near-poor children are four and three times more likely, respectively, than children from higher-income families to have unmet medical needs.⁴⁵

Children of racial minority groups are also disproportionately represented among the underinsured in the United States, as well as more likely to come from low-income families.^{16,48} Despite accounting for only 39% of the population, Black and Hispanic children accounted for 57% of Medicaid/CHIP enrollees in 2016.¹⁵ Racial minorities are more likely to have low health literacy, which is shown to reduce

an individual's ability to navigate the health care system and take responsibility for the health of one's own and one's family.^{10,41} Specific ethnic beliefs, such as fear of deportation or limited faith in the effectiveness of Western medicine, have also been shown to present barriers to care.^{7,49} For instance, Black families who are disproportionately represented among the underinsured have shown disinclination to undergo orthopaedic operation because of physician distrust and increased perception of surgical risk.⁶ Although we did not include socioeconomic status, race, or ethnicity in our analysis, the wait times for publicly insured patients in our study may have been influenced by these factors.

Language barriers have also been shown to significantly affect patients' ability to navigate the health care system.²⁰ For example, Cheng et al¹¹ found that Hispanics uncomfortable speaking English received 22% fewer recommended health services than non-Hispanic Whites or Hispanics who are comfortable speaking English, who, in turn, received less care if they spoke a non-English language at home. Further research shows that California residents with low English proficiency are significantly less likely to have a usual source of care,³⁵ a phenomenon that is also more common among the underinsured in general and presents an additional barrier to care.⁹ According to the National Health Interview Survey, only 72% of uninsured children have a "medical home", compared with 98% of the privately insured, and are 3 times more likely to have gone a year without seeing a health professional.⁹ Without a familiar point of contact in the health care system, patients with orthopaedic injuries may take longer to find a provider, make an appointment, and/or receive a referral to specialty care. Ultimately, any combination of these factors—low socioeconomic status, minority status, attitudes toward the health care system, and a nonregular source of care—may cause delays in coming to the clinic for evaluation or imaging appointments, which can have long-term clinical effects.

There is considerable research showing that delays in care for meniscal injury increase the likelihood of severe tear, secondary cartilage damage, poor surgical success rates, and long-term knee damage that can impair movement, return to sport, and overall quality of life.^{1,14,32,38,40,42,43} Sood et al⁴⁰ found that longer time to surgery for bucket-handle tears significantly reduced the rate of success, from 75% at six weeks to only 59% at 12 weeks. In contrast, our study found that patients with public insurance—despite waiting a mean of 230 days longer between injury and surgery—were not more likely than privately insured patients to have indicators of severe injury; nor did wait time seem to increase the proportion of total patients with indicators of severe injury. These unexpected results may be related to the inability of our small sample size to capture larger trends in severity. It is also possible that our injury severity measures (surgical repair, tear type, and presence and grade of cartilage damage) were not appropriate or comprehensive representations. For instance, these measures may be more reflective of initial injury trauma rather than factors influenced by delays in care, and thus would not be expected to differ between insurance status groups or over wait time.

Furthermore, many surgeons' decision to perform a meniscal repair depends on the intraoperative assessment of the tear pattern; therefore, analyzing surgical repair and tear type may be redundant.

Although our study did not find that injury severity was associated with longer wait times for publicly insured pediatric patients, delays in care inevitably delay return to activity. Considering the importance of the meniscus in knee stability, injury in pediatric patients can significantly limit movements vital for child play and sport participation. Therefore, further investigation should focus on identifying the specific causes of delayed care for which insurance status may act as a proxy, and efforts to reduce these barriers should be exercised. If our aforementioned hypotheses regarding the social determinants of health are correct, possible interventions to reduce wait times for affected patients could include physician training in trust building; educational efforts to improve patient health literacy, offered in multiple languages with recognizable symbols and without medical jargon⁴⁷; extending clinic hours or offering weekend clinics to allow patients with strict work schedules to make appointments; providing interpreters and child care services on-site; validating parking or providing public transportation coupons for visitors; and offering "pop-up" clinics in underserved neighborhoods.

This study had several limitations. First, our small sample size reduced the study's power and reliability. Future analysis could more comprehensively investigate this topic by combining our cases with cases at other safety-net hospitals in the state. Second, it is important to note that the medical system studied here is a safety-net system that does not differentiate access to care based on insurance status; therefore, it is likely that delays in care are magnified at other health care sites where appointments are made preferentially for patients with private insurance, public insurance is not accepted, or the uninsured are denied care.²² We did not perform a root analysis on these delays in care. Therefore, in order to understand the extent to which internal and external factors influence wait time for publicly and privately insured patients, future investigation should compare delays at safety-net and coverage-conscious hospitals. Relatedly, presenting the experience of a single safety-net hospital in an urban center with a robust public insurance program may also have limited the generalizability of our study.

Another limitation of our study was the treatment of patients by several different orthopaedists, which may have reduced the consistency of meniscal tear diagnosis, classification, grading, and surgical approach. We also did not correct for discoid menisci, skeletal age of patient, leg-length discrepancy, degree of initial injury trauma, or certain medical conditions such as hemarthrosis that have been implicated as confounding factors of tear severity.^{3,51} The retrospective nature of this study limited the data available for analysis, but future studies may benefit from a more robust and standardized classification system for meniscal tear type and grade, such as the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) criteria, as described by Anderson and Anderson.³

A further limitation was that because we were unable to analyze social determinants of health, we could not evaluate the mechanisms by which insurance status may affect wait time. Future investigation could collect this information through chart review for primary language, number of health visits in the past year, race, or whether the patient has a designated primary care physician, for example. These parameters could also be determined by surveying patients for family income, race/ethnicity, access to a vehicle, degree of social support, fear or wariness of the health care system, language spoken at home, having a medical home, and health literacy. We were also limited by the inaccessibility of patient referral information, such as referral source and time from referral to clinic presentation. Gathering these data could help future investigators understand whether, for example, patients with a regular primary care physician more easily obtain referral to specialty care, or whether underinsured patients are delayed by a greater number of health care touch points before being evaluated at a clinic. For instance, Medford-Davis et al²⁹ found that uninsured patients evaluated at a public emergency department in Texas disproportionately received “indirect referrals” to a safety-net hospital, which resulted in a median four-day and up to 73-day delay in definitive orthopaedic care.

CONCLUSION

This study found that even in a safety-net setting, publicly insured pediatric patients with meniscal injury waited significantly longer than privately insured patients to receive diagnostic care, although these delays were not associated with greater injury severity. As the pediatric population relies more heavily on public insurance for medical care, it becomes increasingly important to understand how insurance status—or the various socioeconomic and cultural factors it represents—affects the quality of care for these patients.

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