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# Impact of an integrated practice unit on the value of musculoskeletal care for uninsured and underinsured patients

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ABSTRACT

*Background:* Limited access to specialty care for uninsured and underinsured patients may be exacerbated by traditional fee-for-service approaches to care that incentivize volume and intensity of services over value of care. The purpose of this study was to determine the impact of a value-based integrated practice unit (IPU) on access to musculoskeletal care and surgical outcomes in a safety-net population.

*Methods:* A new IPU was implemented on 6/1/2016 at an established safety-net clinic providing musculoskeletal care in central Texas to supplement existing musculoskeletal care provided through a fee-for-service model. This retrospective cohort study compared access and outcomes under the IPU to the parallel fee-for-service clinic through 3/31/2017, as well as the historical fee-for-service clinic from 8/1/2015 through 5/31/2016. Primary outcomes for access included number of referrals addressed; for surgical patients, length of stay, discharge destination, and 30-day readmission rates were assessed.

*Results:* The baseline waitlist of 1401 referrals on 6/1/2016 was eliminated by 3/31/2017. Among patients undergoing hip or knee replacement, length of stay was 1.4 days compared to 2.6 days for patients referred to the parallel fee-for-service clinic ($p < 0.001$), and 92% were discharged home versus 89% ($p = 0.46$). The 30-day readmission rate for the IPU was 2.7%, which did not differ significantly from the HFFS (8.5%, $p = 0.23$) and PFFS (3.7%, $p = 0.64$) clinics.

*Conclusions:* An IPU increased access and improved short-term surgical outcomes in a population of uninsured and underinsured patients seeking musculoskeletal care. Additional studies of longer duration are needed to assess the sustainability of a value-based approach.

*Implications:* A value-based approach to musculoskeletal care may improve access and outcomes in safety-net patients.

*Level of evidence:* III, retrospective cohort study

## 1. Introduction

Underinsured and uninsured patients in the U.S. with musculoskeletal (MSK) complaints commonly experience difficulties accessing specialty care. This can result in prolonged wait times, lack of access to effective treatments, and poor outcomes. Compared to patients with Medicare or private insurance, Medicaid patients with hip and/or knee arthritis are less likely to receive orthopaedic appointments,[1–3] experience longer wait times,[1,3] need to travel farther in order to access care,[4] and have lower preoperative functional status at the time of initial assessment.[4] These factors have been shown to lead to comparatively poorer surgical outcomes in this population.[4–9] While recent government initiatives endeavor to expand coverage for previously uninsured individuals, the success of these efforts has been tempered by rising deductibles, narrower provider networks, and other changes in the health care landscape. Consequently, recent evidence suggests that as many as 31 million people in the U.S. are underinsured,[10] and over 28 million remain uninsured.[11]

Access challenges for resource-limited patients may be exacerbated by traditional fee-for-service models of care delivery, which incentivize high-cost services and reward volume over value, where value is defined as health outcomes per dollar expended.[12–14] In Travis County, Texas, uninsured and underinsured residents receive access to primary and specialty care through the county hospital district, which funds the provision of care through a combination of county property taxes and federal and state funds accessed through intergovernmental transfers. Previously, musculoskeletal care for this population was provided under a fixed budget, fee-for-service model by private community-based orthopaedic surgeons and charity care write-offs by a community hospital. In this system, providers were limited in the number of new patient appointments they could offer. Access for new patients therefore became increasingly challenging due to limitations on outpatient appointment availability, constrained inpatient resources, and lack of active management of the referral queue. As a result, the wait time to

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see an orthopaedic surgeon grew to over 365 days by early 2016.[15] Widespread recognition of this problem coincided with the establishment of a new medical school in Austin focused on implementing a value-based approach to care across the entire health ecosystem.

To address these problems, a pilot program was implemented through a joint effort between the county health district, the medical school, and the hospital system to transition care for upper and lower extremity MSK conditions from a fee-for-service to a value-based approach, incorporating key elements from an integrated practice unit (IPU) model. IPUs are co-located, multidisciplinary care teams organized around a medical condition.[16,17] The IPU embodies key concepts of value-based care such as condition-based organization (upper and lower extremity joint pain), patient education, shared decision-making, a holistic approach, and outcomes measurement including the collection of patient-reported outcomes.[18] By structuring care around the preferences and values of patients and personalizing treatment plans, the team's goals are to maximize the value of each encounter, decrease the burden of frequent, low-value follow-up appointments, and thereby create greater access for the remaining population.

The purpose of this study was to evaluate the effectiveness of a value-based IPU model versus a traditional fee-for-service approach in terms of 1) patient access to care and 2) surgical and outcomes in an underserved patient population.

## 2. Methods

### 2.1. Population

We reviewed clinical data from August 1, 2015 to March 31, 2017 from a safety net clinic based out of the regional Level One trauma hospital. This clinic provides MSK care to patients with health care coverage through the county-funded Medical Access Program (MAP) as well as uninsured patients on a sliding fee scale or on a charity basis. Prior to June 2016, patients with chronic MSK complaints were seen in the historical fee-for-service (HFFS) clinic. On June 1, 2016, a pilot project was initiated whereby patients were sorted based on reason for referral to either the IPU or the parallel fee-for-service (PFFS) clinic. Shoulder and knee patients over the age of 50 years were directed to the IPU clinic, while those 50 and younger were seen in the PFFS clinic. Hip and hand/elbow issues went to the IPU. Given the emphasis on comprehensive, multidisciplinary care, clinic directors selected the IPU patient population to be more likely to have chronic, degenerative conditions that would benefit more from the IPU approach. There were no formal changes made to the in-hospital perioperative protocols, nor was a formal enhanced recovery after surgery pathway implemented.

### 2.2. HFFS and PFFS clinics

The HFFS clinic contracted with private practice physicians using a traditional fee-for-service model and billed a multiple of Medicare reimbursement for professional services. There was no system in place to manage referrals; incoming orthopaedic referrals were faxed and placed in the queue based on the date of the referral. Resource constraints further necessitated paper charting and manual data management. This staffing model, compensation structure, and contractual parameters remained unchanged between the HFFS and PFFS clinics. Where available, data from the HFFS clinic from August 1, 2015 to May 31, 2016 were compared to data from the IPU and the PFFS clinic (June 1, 2016 to March 31, 2017).

#### 2.2.1. IPU

The IPU was staffed by salaried providers. Contracts were negotiated between the county health district and the health system to establish fixed payments to the health system for each clinic session, regardless of the number of patients seen. Multidisciplinary care was provided by having a chiropractor teach patients home exercise programs, nutritionist support for weight loss, and behavioral health services through a psychiatrist. Clinical data gathering before each clinic was heavily emphasized, culminating in a multidisciplinary team huddle prior to seeing patients, thereby ensuring a high-value visit for each patient. Data included condition-specific (hip and/or knee pain and function) and general health patient-reported outcomes measures (PROMs) collected before patient appointments. PROMs included condition-specific measures such as the Hip Disability and Osteoarthritis Outcomes Score – Joint Replacement (HOOS JR)[19] and Knee Injury and Osteoarthritis Outcomes Score – Joint Replacement (KOOS JR),[20] both scored on a scale of 0 (complete joint disability) to 100 (perfect joint health). The Patient-Reported Outcomes Measurement Information System (PROMIS) Global Health measure was used to compare physical and mental health to the general population using t-scores, where a score of 50 indicates the population norm.[21] These PROMs were reviewed prior to the visit, allowing providers to engage in shared decision-making with patients and formulate treatment plans most in line with patients' goals, preferences, and values.

Under the pilot, the IPU team took ownership of the referral process to manage both waitlisted and new referrals. All referrals were triaged based on clinical need by a doctor of chiropractic/family nurse practitioner (DC/FNP) with extensive MSK experience. Appropriate patients were offered virtual visits by phone or video call. The MSK specialists also made themselves readily available to referring providers for real-time consultation by phone or email. IPU providers further visited referring clinics to educate the staff about new referral protocols, emphasize e-consult and phone consult availability, and discuss treatments that could be performed prior to referral.

### 2.3. Data and outcomes measures

Primary outcomes for access to care included number of referrals addressed and change in wait time from referral to appointment. Surgical outcomes measured included the number of procedures performed under diagnosis related group (DRG) 470 (major lower extremity arthroplasty); for surgical patients, length of stay (LOS), discharge destination, and 30-day readmission rates were assessed as metrics of resource utilization.

Secondary outcomes included percent of referrals addressed within 30 days, proportion of new versus follow-up appointments, number of virtual visits conducted, and patient-reported outcomes.

Referral and appointment data, including date of referral, appointment bookings, and date of appointment for funded and unfunded patients were obtained from hospital patient registration and billing software, an electronic data management tool manually maintained by the pilot project team, and web-based referral management software. Access metrics for unfunded patients including referral data were manually tracked and stored in an Excel file. Length of stay, discharge destination, and readmission rates were received from hospital partners. Patient-reported outcomes were exported from an electronic data collection platform.

### 2.4. Statistical analyses

Data analysis was conducted using Microsoft Excel (2016) and StataSE 14 (StataCorp, College Station, TX). Chi square or Fisher's exact tests was used for categorical variables as appropriate. Length of stay was analyzed using Mann-Whitney $U$ tests. A value of $p < 0.05$ was defined as a threshold for significance.

## 3. Results

At baseline, on June 1, 2016, 1401 referrals were on the waitlist to see an orthopaedic surgeon. Eight hundred sixty-two were addressed without the need for a visit, for reasons such as: patient no longer desired an appointment, patient redirected to a more appropriate clinic

**Table 1**
Impact of referral management by the IPU on waitlist time and referrals addressed.

| | Referrals sent prior to June 1, 2016 | Referrals sent June 1, 2016 and after | p value |
|---|---|---|---|
| Time on waitlist, days | > 365 | 59 | – |
| Total referrals, n | 1401 | 1238 | – |
| Referrals addressed within 30 days, n (%) | 29 (2) | 239 (19) | < **0.001** |

Statistically significant values indicated in bold.

based on complaint, patient could not be contacted, or duplicate referral. From June 1, 2016 to March 31, 2017, 1238 referrals were added, of which 492 were addressed for the above reasons. By March 31, 2017, the waitlist was eliminated; all baseline referrals were addressed, and all referrals sent in on June 1, 2016 or later had been triaged by a member of the IPU team.

Patients referred before June 1, 2016 remained on the waitlist for over 365 days, on average. Patients referred during the pilot period waited an average of 59 days, for a reduction in wait time of roughly 84%. Twenty-nine of 1401 referrals (2%) received prior to the pilot were addressed within 30 days, compared to 239 out of 1238 (19%) referrals received during the pilot period ($p < 0.001$, Table 1).

Appointment booking data for the three clinics included funded and unfunded patients. Compared to patients seen in the PFFS clinic, IPU patients were older (52 years vs 45 years, $p < 0.001$) and more were female (55% vs 43%, $p < 0.001$, Table 2). From August 1, 2015 to May 31, 2016, 194 new patients were scheduled in the HFFS clinic (13%, Table 3). During the pilot period, 1044 appointments for new patients were scheduled in the IPU (76%), which was significantly different from both the HFFS and PFFS clinics ($p < 0.001$). In the PFFS clinic, 235 (20%) appointments were new, which was also significantly different from the HFFS clinic ($p < 0.001$). Nine virtual appointments were conducted by the IPU team.

We performed a post hoc analysis to characterize the percent of new patient appointments per month. Over the ten months of the pilot, new patient appointments per month in the IPU decreased from 100% in month one to 71% in month ten. At the same time, this metric increased in the PFFS clinic from 20% to 31% (Fig. 1).

### 3.1. Surgical and patient-reported outcomes

Under the HFFS clinic, 82 out of 1459 patients scheduled to be seen underwent hip or knee arthroplasty (DRG 470) from August 1, 2015 to June 1, 2016. Thirty-seven out of 1368 patients scheduled to be seen in the IPU underwent hip or knee arthroplasty from June 2016 through March 2017, compared to 54 out of 1167 patients scheduled with the PFFS clinic during the same period. The median age of surgical patients seen in the PFFS clinic (54 years) was younger than the median age of those seen in the HFFS clinic (61 years) but not the IPU (58 years). Only 8.1% of patients seen in the IPU had Medicare insurance, a lower proportion than the HFFS (29.3%, $p = 0.010$) and PFFS (27.8%, $p = 0.031$) clinics.

The average LOS was 1.4 days for IPU patients compared to 2.9 days for HFFS patients and 2.6 days for PFFS patients ($p < 0.001$ for both, Table 3). Ninety-two percent of IPU patients were discharged home compared to 89% from the HFFS clinic ($p = 0.45$) and 89% from the PFFS clinic ($p = 0.46$). The 30-day readmission rate for the IPU was 2.7%, which did not differ significantly from the HFFS (8.5%, $p = 0.23$) and PFFS (3.7%, $p = 0.64$) clinics (Table 3).

The mean PROMIS Global Health – Physical Health component t-score for all IPU patients at initial presentation was 32, nearly two standard deviations below the population mean, while the mean PROMIS Global Health – Mental Health component t-score at initial presentation was 42, within one standard deviation of the population mean (Table 4). The mean HOOS JR and KOOS JR scores at initial presentation were 41 and 36, respectively. While no population benchmarking is available for the HOOS JR, the KOOS JR is derived from the full-length KOOS, for which the population mean has been established as 86.[22] For surgical patients, the mean improvement in HOOS JR and KOOS JR scores was 20 points (51%) and 15 points (41%), respectively. On average, PROMIS Global Health – Physical Health scores improved by 5 points (16%), while PROMIS Global Health – Mental Health scores improved by 3 points (8%).

## 4. Discussion

Despite studies suggesting that access to specialty care in the U.S. is timely,[23,24] disparities in access and the result on health outcomes are apparent in patients with hip and knee arthritis who undergo lower-extremity joint arthroplasty.[1–4] Moreover, uninsured and underinsured patients are likely underrepresented in such studies as only 43% of orthopaedic practices accept Medicaid patients.[23] In Central Texas, a population of safety-net patients faced wait times of over one year to see an orthopaedic specialist prior to the implementation of an IPU for MSK care. We sought to understand the effect of a value-based approach to MSK care, and found that an IPU improved access and surgical outcomes in a population of socioeconomically disadvantaged patients.

Through active referral management by the IPU team and by applying a patient-centered, team-based approach to care, we significantly increased access to care in less than a year. The proportion of new appointment bookings in the IPU were significantly higher (76% compared to 13% in the HFFS and 20% in the PFFS), and 19% of referrals were addressed within 30 days compared to 2% prior to the pilot. Moreover, these benefits were apparent even in the PFFS clinic, which increased its proportion of new patient appointments to 31%. Our results support previous literature showing that pre-screening and active triage of referrals by specialists improves access to care.[25–30] We accomplished this through a multipronged approach, including phone and e-consult support for referring providers, coordination of referrals to the appropriate specialty service, and virtual appointments. We found that the proportion of new patient appointments in the IPU clinic decreased, as expected, to 71% in month ten. Further studies should determine at what point the proportion of new patient appointments stabilizes. Importantly, we demonstrated that improved access to care can be achieved even in a highly resource-constrained environment by instituting systematic practices for referral management.

We also reduced our wait time by 84% from > 365 days to an average of 59 days. Chen et al.[29] reported a 77% reduction in wait time for rheumatology appointments from 126 days to 29 days using a e-consult system with active engagement of specialists to determine

**Table 2**
Patient demographics.

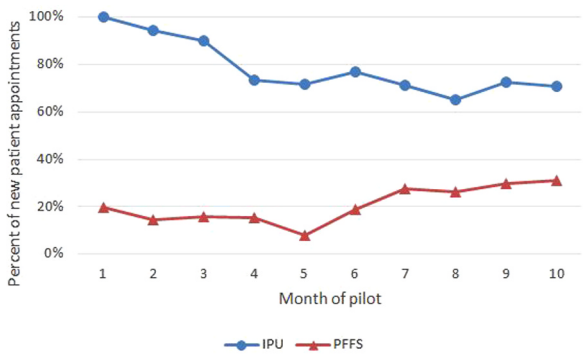
| | HFFS clinic | PFFS clinic | IPU | PFFS-IPU p value |
|---|---|---|---|---|
| Patients | 710 | 312 | 916 | – |
| Age in years, mean ± SD | – | 45 ± 14 | 52 ± 12 | < **0.001** |
| Female, n (%) | – | 131 (43) | 502 (55) | < **0.001** |

IPU: integrated practice unit, HFFS: historical fee-for-service, PFFS: parallel fee-for-service Statistically significant values indicated in bold.

**Table 3**
Impact of the IPU model on access and surgical outcomes.

| | HFFS clinic | PFFS clinic | IPU | HFFS-PFFS p value | PFFS-IPU p value | HFFS-IPU p value |
|---|---|---|---|---|---|---|
| **Access** | | | | | | |
| Scheduled encounters | 1459 | 1167 | 1368 | – | – | – |
| New patient appointments, n (%) | 194 (13) | 235 (20) | 1044 (76) | **< 0.001** | **< 0.001** | **< 0.001** |
| **Surgical Outcomes** | | | | | | |
| Hip or knee arthroplasty cases (DRG 470) | 82 | 54 | 37 | – | – | – |
| Average LOS in days, mean ± SD | 2.9 ± 2.0 | 2.6 ± 2.0 | 1.4 ± 0.6 | 0.069 | < 0.001 | < 0.001 |
| Patients discharged home, n (%) | 73 (89) | 48 (89) | 34 (92) | 0.98 | 0.46 | 0.45 |
| 30-day readmissions, n (%) | 7 (8.5) | 2 (3.7) | 1 (2.7) | 0.23 | 0.64 | 0.23 |

IPU: integrated practice unit, HFFS: historical fee-for-service, PFFS: parallel fee-for-service, DRG: diagnosis related group, LOS: length of stay Statistically significant values indicated in bold.




IPU: integrated practice unit, PFFS: parallel fee-for-service

**Fig. 1.** Monthly proportion of new appointments booked in the IPU and PFFS clinics.

**Table 4**
Patient-reported outcomes under the IPU model for patients with hip and/or knee conditions.

| | Results |
|---|---|
| **New Patients** | |
| HOOS JR score, mean ± SD | 41 ± 23 |
| KOOS JR score, mean ± SD | 36 ± 20 |
| PROMIS Global Health - Mental Health component score, mean ± SD | 42 ± 11 |
| PROMIS Global Health - Physical Health component score, mean ± SD | 32 ± 8 |
| **Follow-up patients** | |
| Change in HOOS JR score, mean (%) | 20 (51) |
| Change in KOOS JR score, mean (%) | 15 (41) |
| Change in PROMIS Global Health - Mental Health component score, mean (%) | 3 (8) |
| Change in PROMIS Global Health - Physical Health component score, mean (%) | 5 (16) |
| Percent satisfied or very satisfied with results of treatment, n (%) | 53 (75) |

IPU: integrated practice unit, HOOS JR: Hip Disability and Osteoarthritis Outcomes Score - Joint Replacement, KOOS JR: Knee Injury and Osteoarthritis Outcome Score - Joint Replacement, PROMIS: Patient-Reported Outcomes Measurement Information System.

appropriateness of referrals. Although our wait time was longer, our baseline of over one year was much higher, we had one member of the MSK IPU team managing referrals, and we did not have the efficiency of an e-consult system. We believe that the change in wait time was not accomplished solely by expanding the number of providers offering MSK care. Had the proportion of new patients seen in the IPU been similar to that of the HFFS or PFFS clinics, the waitlist would not have been impacted nearly as much. Ultimately, by improving the referral management process, we were able to minimize delays in care that often result in worse patient outcomes or drive patients to seek care in an emergency department.

Patients undergoing hip or knee arthroplasty from lower socioeconomic backgrounds have longer lengths of stay, higher acuity discharge destinations, and more readmissions.[31] Low socioeconomic status, minority race, and female gender together lead to a two times greater risk for long LOS.[32] While our demographic information was limited, our patient-centered, value-based approach achieved significant improvements across our population of uninsured and underinsured patients. Compared to the PFFS clinic, we achieved a 44% decrease in LOS with no significant difference in the proportion of patients discharged home. Although these results may be attributed to a difference in providers, we believe that this change was more likely achieved by applying IPU principles to the in-hospital environment, including the emphasis on patient education, multidisciplinary care, empowering team members, and emphasis on early mobilization and discharge home.

Previously, concerns have been raised that care for medically complex patients or patient populations with a historically high intensity of resource utilization may be disincentived under alternative payment models.[33,34] In traditional fee-for-service models, providers are financially incentivized to deliver a higher volume and intensity of services, rather than greater value. Specialty providers in the IPU model were salaried, so their compensation was not impacted by the number of surgeries performed. Thus, a patient's (or provider's) decision to proceed with surgery was neither financially incentivized nor disincentivized. A recent study showed a similar change in health care spending across low-socioeconomic-status patients and high-socioeconomic-status patients under a population-based payment model.[35] While the proportion of IPU patients receiving surgery was lower than the proportion of PFFS patients, there was no surgical quota or cap on the number of surgeries that the IPU could perform. We therefore believe that the value-based IPU model emphasized appropriate surgery by engaging patients in shared decision-making and addressing modifiable risk factors prior to surgery.

A patient-centered, value-based IPU model was also highly successful in addressing social needs in this heterogeneous, psychosocially complex patient population. Home exercise programs taught to over 200 patients in clinic obviated the need for in-person physical therapy for many patients. For the nine patients considering smoking cessation, counseling by our providers helped four succeed in quitting. One patient achieved the weight reduction required for surgery (BMI < 40) and nine other surgical candidates were working toward weight loss and/or smoking cessation goals. Other services provided to patients included housing assistance for two and expedited referrals to other specialists (dental care, rheumatology) for four patients. Although we are unable to compare these metrics to historical performance, we feel these successes are substantial achievements in helping our patients achieve better health. Since a fundamental tenet of an IPU is outcomes measurement and using data to continually drive improvements in care, we will be better positioned to measure results at future time points.

### 4.1. Limitations

We acknowledge several limitations with this study. We are limited by the retrospective design of this study. Due to the nature of an IPU, multiple changes in care delivery were implemented simultaneously, thus making it difficult to ascertain the impact of each individual factor. It is possible that certain elements of the IPU model are more critical than others in achieving increased value, but insufficient data are available to evaluate and quantify such potential differences. Although no formal changes were made in the post-operative recovery protocols, it is possible that the IPU surgeon's approach to care incorporated elements of an enhanced recovery after surgery approach that could have contributed to the decreased length of stay observed. Patients were not randomly assigned to treatment, which may introduce bias. The intentional sorting of patients to either the IPU or PFFS clinics based on reason for referral may have introduced confounding factors. Additionally, we were unable to control for patient factors such as demographics or comorbidities due to the impracticality of reviewing thousands of paper charts. In general, the sorting system placed more elderly and comorbid patients into the IPU which should have negatively impacted the results, if anything.

We are limited by the accuracy of data sources, namely administrative claims data and manual data collection, which introduces the possibility of data entry error. Due to a lack of infrastructure, some data were not available prior to the pilot, which limits our ability to draw conclusions regarding the impact of the IPU. We were unable to compare PROMs before and after initiation of the pilot due to a lack of baseline data. Possible bias may also derive from differential ability to reach patients in order to schedule appointments in either the PFFS or IPU clinics. Furthermore, due to infrastructure and resource constraints, we were only able to collect follow-up patient-reported outcome measures on patients who returned for follow-up appointments.

Further, we are limited by our sample size and patient population, and our results may not be generalizable to other care settings. We did not set out to assess cost effectiveness; hence, the financial aspects of the IPU model are not reported here. The cost-savings derived from the shorter LOS should be weighed against the investment needed to build an IPU, including providing additional multidisciplinary services.

## 5. Conclusion

Implementing a patient-centered, value-based IPU was effective in improving access to MSK care in an uninsured and underinsured patient population. We also found an increase in the value of care demonstrated by decreased resource utilization associated with a lower extremity joint replacement episode. Moreover, an IPU's multidisciplinary approach offers intangible benefits that are not incentivized in the traditional fee-for service model. Future studies are needed to assess the long-term benefits and sustainability of this approach.

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