Lessons Learned Compiling Data from Multiple Clinical Sources to Understand Differences in Post-Surgical Shoulder Pathology in Diabetics and Pre-Diabetics

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Introduction

- Diabetic patients suffer from shoulder joint pathologies at a rate five times higher than the non-diabetic population.[1]
- Diabetes is an independent risk factor for postoperative complications.[2] We sought to determine to what extent prediabetics experience shoulder surgery complications.
- We set out to review rotator cuff repair (RCR) procedures at the Missouri Orthopaedic Institute (MOI) from January 1st, 2015 through December 31st, 2020.

- There are significant roadblocks to studying our original research question:
  - Delays associated with data requests
  - Unexpected source file formatting that required manual manipulation
  - Multiple patient identifiers used in different records systems
  - Less-than-expected completion of patient outcome questionnaires
- We present the challenges associated with receiving, cross-referencing, and organizing patient data in order to prepare for data collection and analysis.

Methods

Outcomes are measured to assess postoperative recovery and improvement.
- Changes in functional status are measured using patient-reported outcome measures (PROMs).
- MOI currently uses PatientIQ (PIQ) to receive questionnaire responses virtually.
- We use well established shoulder measures ASES, SANE, and Simple Shoulder Test results.

Definition of diabetes:
- Patients who underwent RCR procedures were grouped into diabetes, prediabetes, or non-diabetic based on their perioperative HbA_{1c}% on PowerChart.
  - HbA1c values < 5.7% were categorized as non-diabetics.
  - Values between 5.7% and 6.4% were grouped as prediabetics.
  - A reading ≥ 6.5% qualifies a patient as diabetic.

Identifying patients:
- We sent separate data requests to both the MOI billing department and the Tiger Institute for Health Innovation.
- The request was for a list of every patient receiving a RCR procedure, regardless of diabetic status.
  - Delays at the Tiger Institute caused us to consider different sources for our data.
- Tiger Institute research data requests are now sent via **QR code link**.
- These lists did not contain the same number of procedures.
- We will only use the MOI list in our initial results due to the increased sample size.
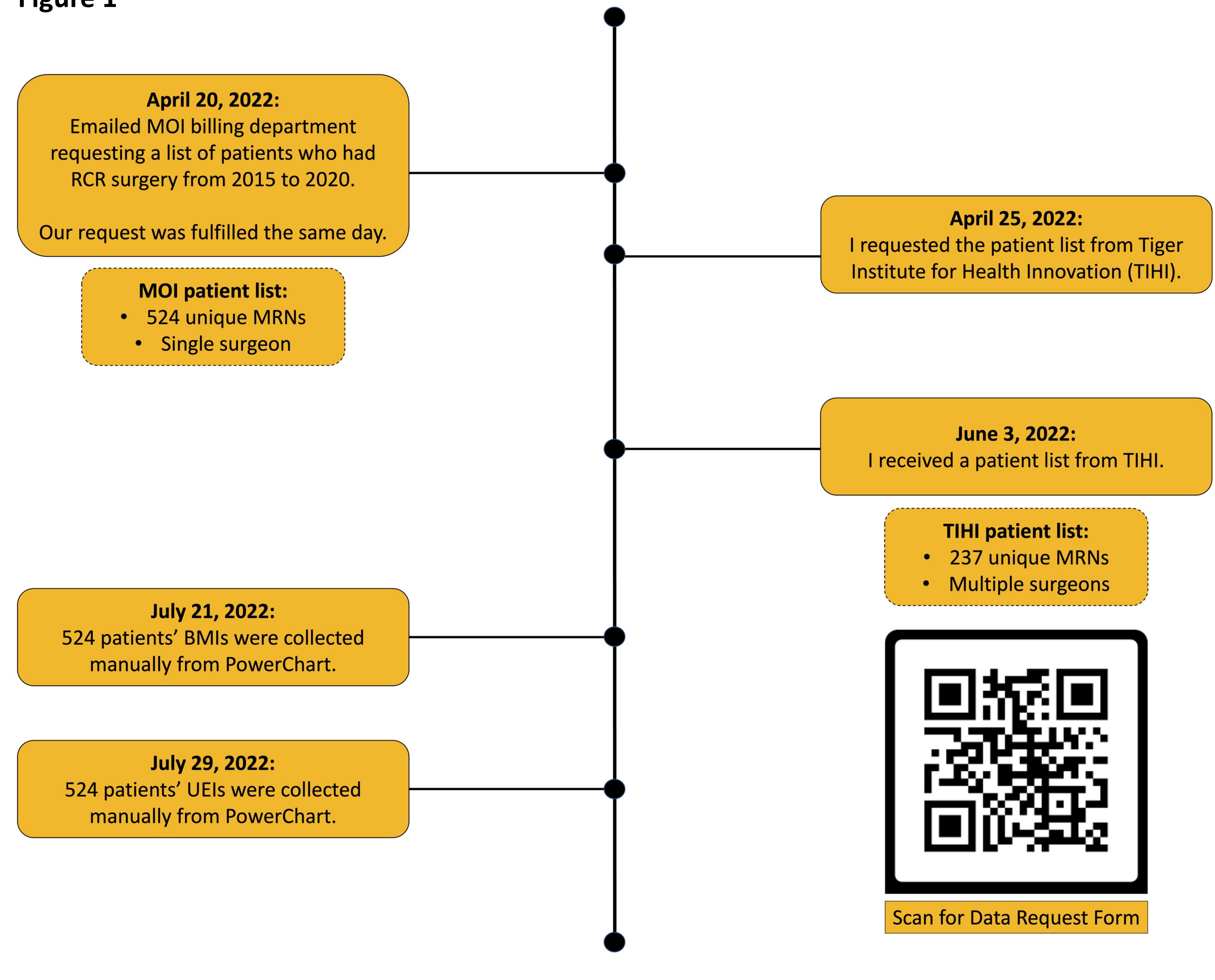
Figure 1

April 20, 2022: Emailed MOI billing department requesting a list of patients who had RCR surgery from 2015 to 2020.

Our request was fulfilled the same day.

MOI patient list:
- 524 unique MRNs
- Single surgeon

April 25, 2022: I requested the patient list from Tiger Institute for Health Innovation (TIHI).

June 3, 2022: I received a patient list from TIHI.

TIHI patient list:
- 237 unique MRNs
- Multiple surgeons

July 21, 2022: 524 patients' BMIs were collected manually from PowerChart.

July 29, 2022: 524 patients' UEIs were collected manually from PowerChart.

Scan for Data Request Form

Figure 1: A timeline of events shows data request wait times and the differences in available datasets.

Figure 2

PowerChart

Patients identified by:
- Last name
- First name
- Medical record number (MRN)

Integration of both systems is necessary to extract variables from each data source

PatientIQ

Patients identified by:
- Last name
- First name
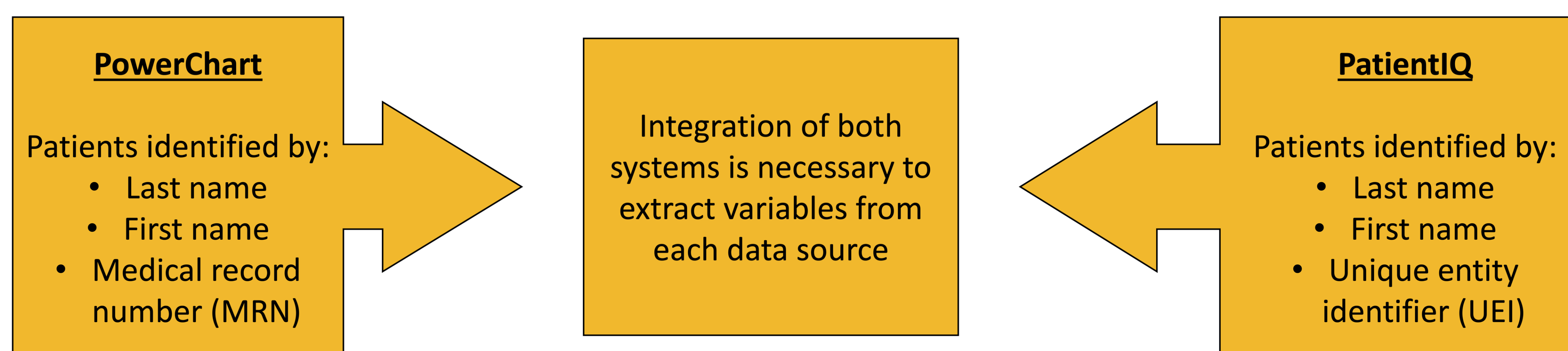- Unique entity identifier (UEI)

Figure 2: Each data platform uses a separate unique identifying number for patients, which required us to match them manually.

Discussion

- Clear communication with the Tiger Institute could have returned files requiring less manual data extraction. Institute staff were responsive to our questions.
  - For example, we needed HbA1c values within a certain time range. When we filed our Tiger Institute data request, we received every HbA1c ever drawn for our patients.
- Data collection was further complicated by either:
  - (a) inconsistent usage of the PIQ platform by MOI providers or;
  - (b) imperfect migration of PROMs data from previous software into PIQ.
- PIQ was rolled out at MOI during this study's time period of interest.
- Patients often completed only pre- or post-operative questionnaires, making it difficult to measure the differences due to surgery.
- Unique entity identifier (UEI) is used separately from medical record number (MRN) to identify patients.
  - Patients in PIQ were identified by a UEI, while PowerChart identifies patients by MRN. This led to further delays in matching patients in each system.

Results & Recommendations

- Clinical researchers seeking to use MU Healthcare data should consider unexpected challenges in various stages of their projects.
- A clear understanding of PIQ and Tiger Institute capabilities can greatly reduce time burden on similar research questions.
- Some new variables required a separate collection of patient PowerChart data.
  - Manual confirmation of some values greatly increased the time burden and delayed meaningful progress.
- Relying more heavily on Tiger Institute personnel or refinement of data queries likely could have lessened the time spent on manual PowerChart review.
- Functional surgical outcome measures involving the use of online patient questionnaires may not be as successful as expected due to both provider uptake and patient completion.

References

1. Ramirez, Jason. "Adhesive Capsulitis: Diagnosis and Management." *American Family Physician* 99, no. 5 (March 1, 2019): 297–300. Link 2. **(QR Code Link 2)**
2. Yang, Lingdi, Jun Zhang, Dengfeng Ruan, Kun Zhao, Xiao Chen, and Weiliang Shen. "Clinical and Structural Outcomes After Rotator Cuff Repair in Patients With Diabetes: A Meta-Analysis." *Orthopaedic Journal of Sports Medicine* 8, no. 9 (September 1, 2020): 2325967120948499. https://doi.org/10.1177/2325967120948499. **(Link 3)**

Acknowledgements