MEASURING HEALTH SYSTEM PATIENT FLOW

Shubham Lahoti | Axtria Inc.

PROBLEM STATEMENT

De-duplicate patient flow at affiliated accounts level to measure Health System Potential

INTRODUCTION

- IDNs / Health Systems are increasingly becoming important due to the influence they exert
- Well established methodologies exist to calculate potential of individual accounts, but it is difficult to measure potential at a Health System level due to shared customers
- It is becoming important to assign optimal targeting effort not only at the account level but also at the Health System level.

ASSUMPTIONS

Account / hospital potential is available through two methodologies:

- Duplicated potential: assumes the same patient going to multiple hospitals (e.g., from claims data)
- Unique potential: Data that assumes no patient overlap within hospitals

SOLUTION

- Measure “SHARED” patient flow between hospitals in a geography
- Use that to measure “DUPLICATED” patients in a Health System(s) in that HSA and use those to calculate HS / IDN unique patients

METHOD

Methodology to estimate hospital potential assumes unique patients are going to each hospital in a HSA

HS – 1: 3 hospitals A, B, C HS – 2: 2 hospitals D, E

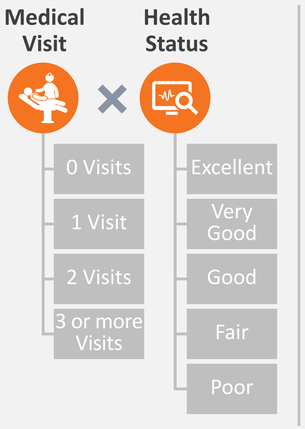
WHY?
All hospitals in a HSA are not independent and will be sharing patients.
Hence, patients for hospitals, same Health System, need to be adjusted to account for ‘shared patients’.

HOSPITALS IN HSA

Duplicating Patient Flow (Hospital)

CLAIMS data based adjustment to original patient flow

Hospital Utilization

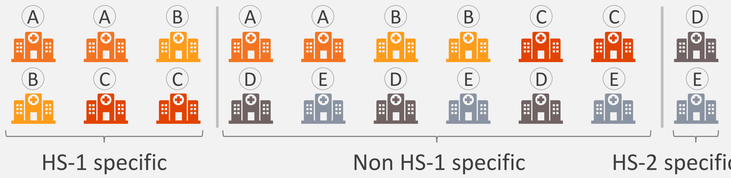


Shared Patient Flow

Reduce ‘**Original**’ patient flow from ‘**Duplicated**’ patient flow to get ‘**Hypothetical Shared**’ patient flow at account/ HSA/ HS level

Consider all possible hospital links for deduplication

Chance of a person walking in the gates of the hospital is assigned for each category to estimate **‘Hospital Utilization Factor’**



For any link, get **‘link score’** as minimum of ‘hypothetical shared’ patient flow of the contributing elements

$$linkScore(HS-1) = linkScore(all\ HS-1\ links) = linkScore(A-B) + linkScore(B-C) + linkScore(C-A)$$

Patient shared between hospitals (of different HS) is not deduplicated as they are ‘potential’ for all HS

$$HS\ -\ 1\ Share\ \% = \frac{linkScore(HS-1)}{linkScore(HS-1)+linkScore(non\ HS-1)}$$

$$De-duplicated\ \boldsymbol{HS}\ patientFlow = Duplicated\ \boldsymbol{HS}\ patientFlow - \left((\boldsymbol{HS}\ Share\ \%) * 'Hypothetical\ Shared'\ patientFlow\ at\ \boldsymbol{HSA\ level}\right)$$

RESULTS / USE CASES

- Better estimation of Health System potential and efficient targeting by Account Managers
- Additional Health Systems identified as targets that were responsible for sale to affiliated accounts

CAVEATS / DISCUSSION

- **Deduplication:** in some cases ‘duplicated’ potential might be available. In this methodology claims data was not perfect and cannot be used as is. Hence, it was only used to duplicate original patient flow based on business considerations
- **Unique Patient Flow:** in some cases, original patient flow itself may not be unique patient flow and one may require to measure ‘unique’ patient flow (methodology was developed in-house)
- **Hospital Utilization Factor:** This was required to be measured in this particular problem and depending on the situation, one may not need it
- **Hypothetical Shared Patient Flow:** This is the most important piece of the puzzle and most calculations were to support its measurement
- **HSA:** One can try using any other geographical area instead of HSA, but it was chosen due to its robustness

DATA SOURCES

- Medical Visits: Census
- Health Status: Census
- Claims Data
- Hospital Service Area (HSA): Dartmouth

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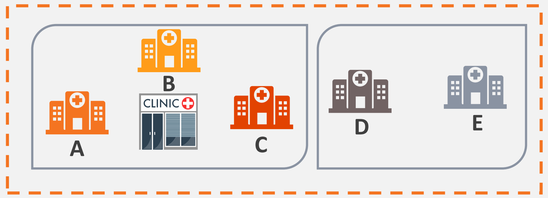
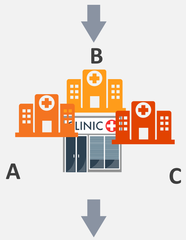
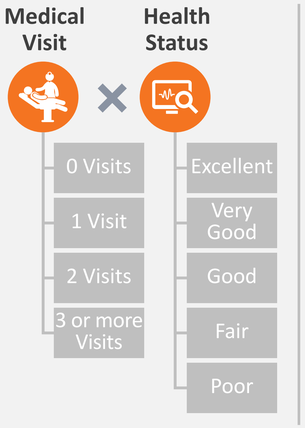
Non-Hospital Potential Deduplication



Clinics / non-Hospital accounts in a Health System



Hospital Utilization



- Non-hospital account potential to be reduced using ‘Hospital Utilization Rate’ corresponding to hospital accounts in that HS to calculate for duplicated patients
- For any account with potential p, de-duplicated potential is:

$$p_{deduplicated} = p * \left(1 - hospitalUtilization * \frac{number_{hospitalsInHS-HSA}}{number_{hospitalsInHSA}}\right)$$

(in above example the factor will $\frac{3}{5}$:=> 3 in HS-1, 5 in total HSA)

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