Creating a Standardized Algorithm to support Discharge Planning

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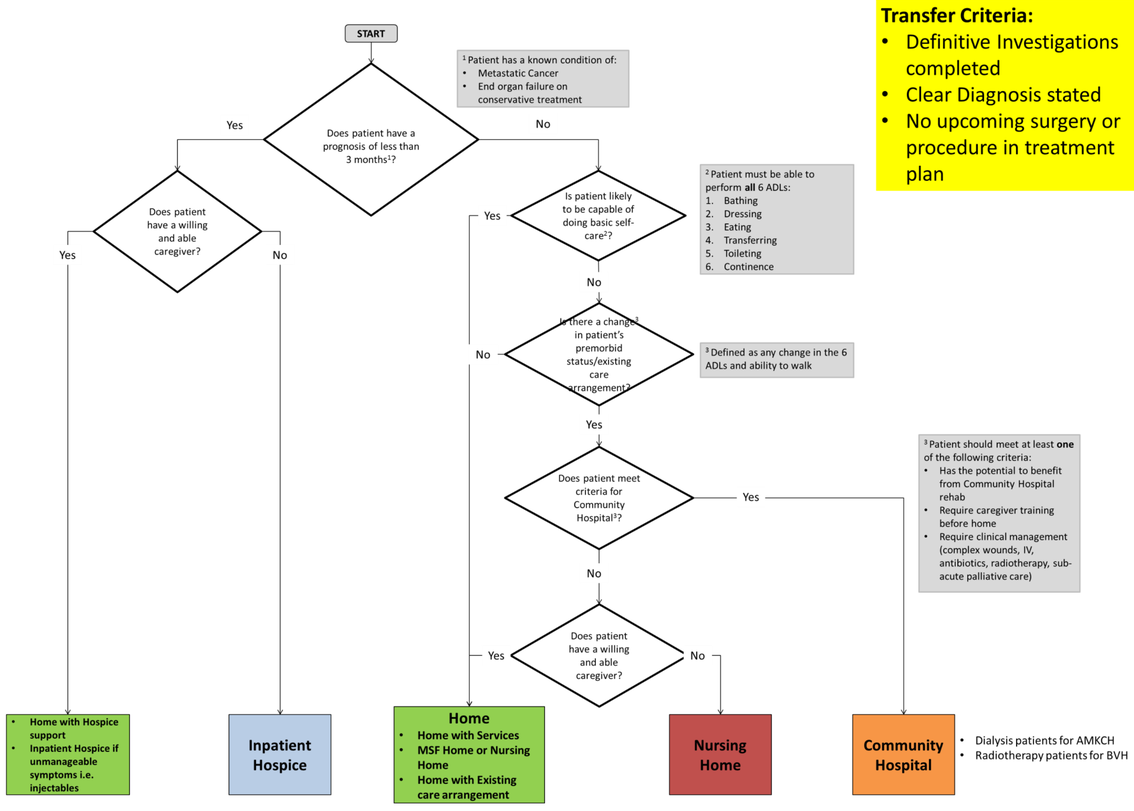
1. Introduction

As multi-disciplinary inputs are required for the patient's disposition, different healthcare professionals are often not aligned on discharge plans of the patient. Critical information needed for discharge planning is also scattered across various systems, making it difficult for a discharge plan to be decided upon as soon as possible. This causes a delay in necessary preparations needed to be made, resulting in a longer length of stay for the patient. The lack of a standard disposition criteria also causes rework and delays when patients are referred to unsuitable Intermediate and Long Term Care (ILTC) facilities or services.

Aim To develop requirements for a standardized disposition algorithm for all patients that suggest the most suitable disposition location based on the patient's clinical and social needs with an accuracy of at least **80%**.

2. Methodology

A multi-disciplinary team, facilitated by Process Transformation & Improvement (PTI), gathered for a series of workshops where the team determined and prioritised the critical clinical and social information needed for decision of disposition. An algorithm was then designed and improved upon reiteratively as the team tested out the algorithm on different cases. The following algorithm was derived (Figure 1).



Transfer Criteria:
- Definitive Investigations completed
- Clear Diagnosis stated
- No upcoming surgery or procedure in treatment plan

Figure 1: Standardized Algorithm for Discharging Patients

3. Pilot Test

Phase 1

38 cases were observed daily from October to November 2017 from different wards (medical and surgical), and the algorithm was run manually by doctors and nurses in our team once the patient has met the transfer criteria defined.

While the accuracy of the disposition algorithm performed significantly higher at **86.8%**, it took longer for the decision to be made at **5.05 days**. This was attributed to the stabilisation of patients' conditions as they stayed longer, allowing the algorithm to make the decision with more complete and accurate information.

Phase 2

To facilitate earlier discharge planning, a second pilot test was conducted with an additional objective:

To predict with at least 80% accuracy the patient's disposition location, and determine the **earliest day** that the algorithm can run.

A random sample of 339 cases (based on 95% confidence level) was selected to test the algorithm manually on Day 2, Day 3 and Day 4 of the patient's admission (Figure 2).

S/N	Case Number	Patient ID	Date of Admission	Date of Decision of discharge location (written on case notes) *(baseline)*	Date of discharge	Recommended Discharge Location by algorithm on Day 2 of admission	Recommended Discharge Location by algorithm on Day 3 of admission	Recommended Discharge Location by algorithm on Day 4 of admission	Recommended Discharge Location by primary care team (List all in order if there are changes) *(baseline)*	Final Discharge Location
Eg.	*6712345689X*	*S1234567X*	*dd/mm/yy*	*dd/mm/yy*	*dd/mm/yy*	*Community Hospital*	*Community Hospital*	*Community Hospital*	*Community Hospital*	*Home*
1	[redacted]	[redacted]	07/12/2017	12/12/2017	16/12/2017	Home	Home	Home	Home	Home
2	[redacted]	[redacted]	07/12/2017	10/12/2017	13/12/2017	Home	Home	Home	Home	Home
3	[redacted]	[redacted]	02/12/2017	03/12/2017	12/12/2017	Community Hospital	Community Hospital	Home	Home after CGT to helper	Home
4	[redacted]	[redacted]	06/12/2017	11/12/2017	12/12/2017	Community Hospital	Community Hospital	Home	Home	Home
5	[redacted]	[redacted]	29/11/2017	01/12/2017	10/12/2017	Home	Home	Home	Home	Home
6	[redacted]	[redacted]	29/11/2017	03/12/2017	07/12/2017	Home	Home	Home	Home	Home
7	[redacted]	[redacted]	29/11/2017	07/12/2017	07/12/2017	Home	Home	Home	Home	Home
8	[redacted]	[redacted]	03/12/2017	04/12/2017	07/12/2017	Community Hospital	Home	Home	Home	Home
9	[redacted]	[redacted]	27/11/2017	07/12/2017	08/12/2017	Community Hospital	Community Hospital	Community Hospital	Home	Home

Figure 2: Sample of data collection form used for Pilot Phase 2

4. Results

	Measure	By Primary Care Team	Disposition Algorithm (Day 2)	Disposition Algorithm (Day 3)	Disposition Algorithm (Day 4)
ALL cases	No. of Cases*	339	339	328[1]	311[2]
	Accuracy of recommending **final** disposition location *(Percentage of cases where final disposition location is the same as recommended)*	87.0%	79.4%	83.2%	86.5%
Cases with LOS <21 days	No. of Cases	262	262	251	234
	Accuracy of recommending **final** disposition location	89.3%	84.7%	88.4%	91.5%

Table 1: Results of Pilot Phase 2

[1] 11 cases excluded as they were discharged before Day 3
[2] 28 cases excluded as they were discharged before Day 4

From the pilot, the algorithm was able to achieve the target accuracy by Day 3 at 83.2%. The accuracy rose to 84.7% by Day 2 for cases with a length of stay (LOS) less than 21 days(Table 1). Cases with LOS of more than 21 days were excluded as they are likely to be more complex cases that would need more time before the patient's condition stabilises.

The potential bed days saved were calculated and summarized in the table below (Table 2). The figures are calculated based on the assumption that the primary team makes the decision for disposition location for all discharges on Day 6 (based on the average time taken for the primary care team to make a decision during Pilot Phase 2), and all patients are fit for discharge when the decision is made.

Decision made on	Day 2 (79.4%)	Day 3 (83.2%)
Community Hospitals	10,664 bed days saved	8,149 bed days saved
Nursing Home	1,196 bed days saved	914 bed days saved
Hospice	750 bed days saved	573 bed days saved
Potential Bed Days saved per year*	12,610 bed days	9,636 bed days
Potential Additional Admissions per year#	2,116 admissions	1,617 admissions
Potential Beds saved per year^	39.9 beds	30.5 beds

Table 2: Potential bed days saved if algorithm is run on Day 2 or Day 3

 # Based on average length of stay of 5.96 days, 01/01/17 to 27/12/17.
^ Based on bed occupancy rate of 86.6%, 01/01/17 to 27/12/17.

5. Future Plans

With the promising results from the pilot, the team will be working to incorporate the algorithm into our electronic medical records (EMR) and appropriate electronic Coordinated Clinical Pathways.

System automatically extracts relevant medical and social information from the EMR to run the algorithm

A recommended discharge location and follow up actions needed is automatically communicated to the primary care team