

Hospital RRT Activations

A closer look through data visualisation



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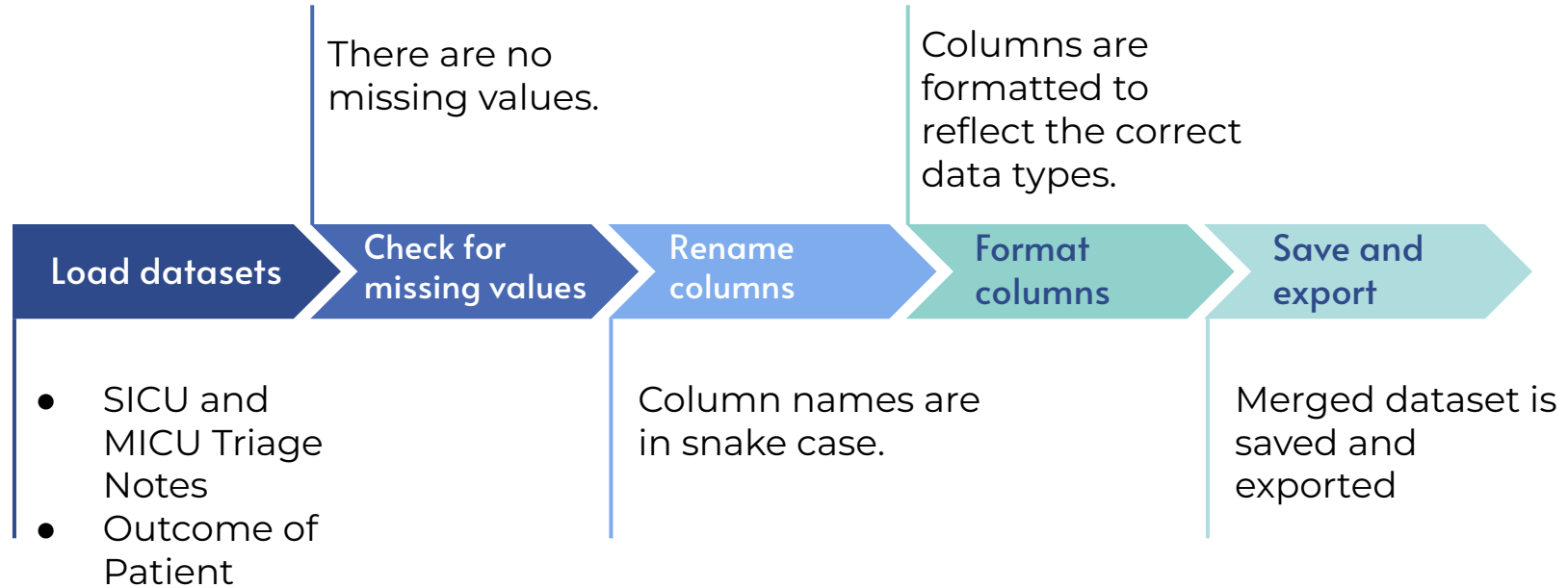
01. Problem Statement

To conduct data analyses on the total number of RRT activations based on fiscal year 2019 - 2020 (April 2019 - March 2021)

Background

- Failures in planning and communication, and failure to recognize when a patient's condition is deteriorating, can lead to failure to rescue and become a key contributor to in-hospital mortality.
- If identified in a timely fashion, unnecessary deaths can often be prevented.
- **Rapid Response Team (RRT)** is a team of clinicians who bring critical care expertise to the patients.

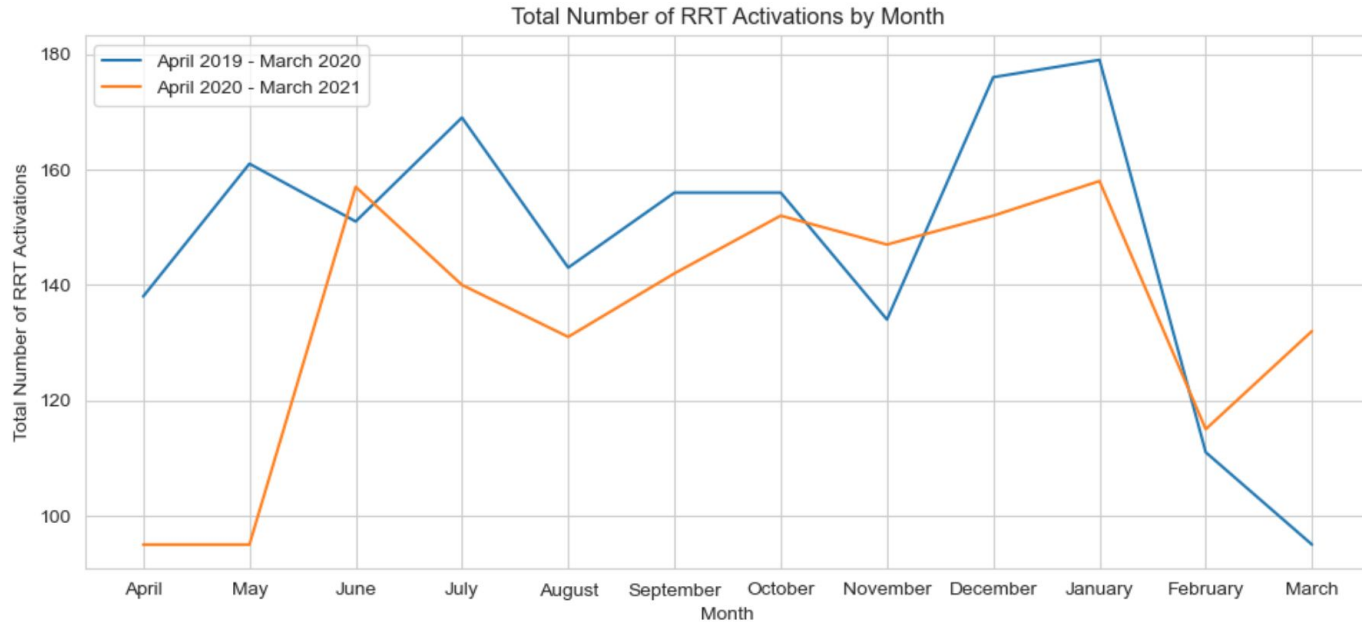
02. Dataset Preparation and Preprocessing



03. Exploratory Data Analysis - Total Number of RRT Activations by Month

	count	month	year
authored_date_time			
2019-04	138	April	2019
2019-05	161	May	2019
2019-06	151	June	2019
2019-07	169	July	2019
2019-08	143	August	2019
2019-09	156	September	2019
2019-10	156	October	2019
2019-11	134	November	2019
2019-12	176	December	2019
2020-01	179	January	2020
2020-02	111	February	2020
2020-03	95	March	2020
2020-04	95	April	2020
2020-05	95	May	2020
2020-06	157	June	2020
2020-07	140	July	2020
2020-08	131	August	2020
2020-09	142	September	2020
2020-10	152	October	2020
2020-11	147	November	2020
2020-12	152	December	2020
2021-01	158	January	2021
2021-02	115	February	2021
2021-03	132	March	2021

03. Exploratory Data Analysis



- There is a somewhat similar trend in the total number of RRT activations across the two fiscal years.
- There is a general increasing trend in the first quarter, followed by smaller fluctuations in the second and third quarters, then a decreasing trend in the last quarter of the fiscal year.
- The peaks in the number of RRT activations are in June/July and December/January periods. These coincide with the main school holiday and festive periods in Singapore. Some patients might face more stress during such [festive periods](#) resulting in incidences of serious adverse events and RRT activations. Furthermore, there might be a crunch in the hospital manpower, resulting in [patient deterioration not being recognized and responded to in a timely manner](#) and subsequent RRT activations.

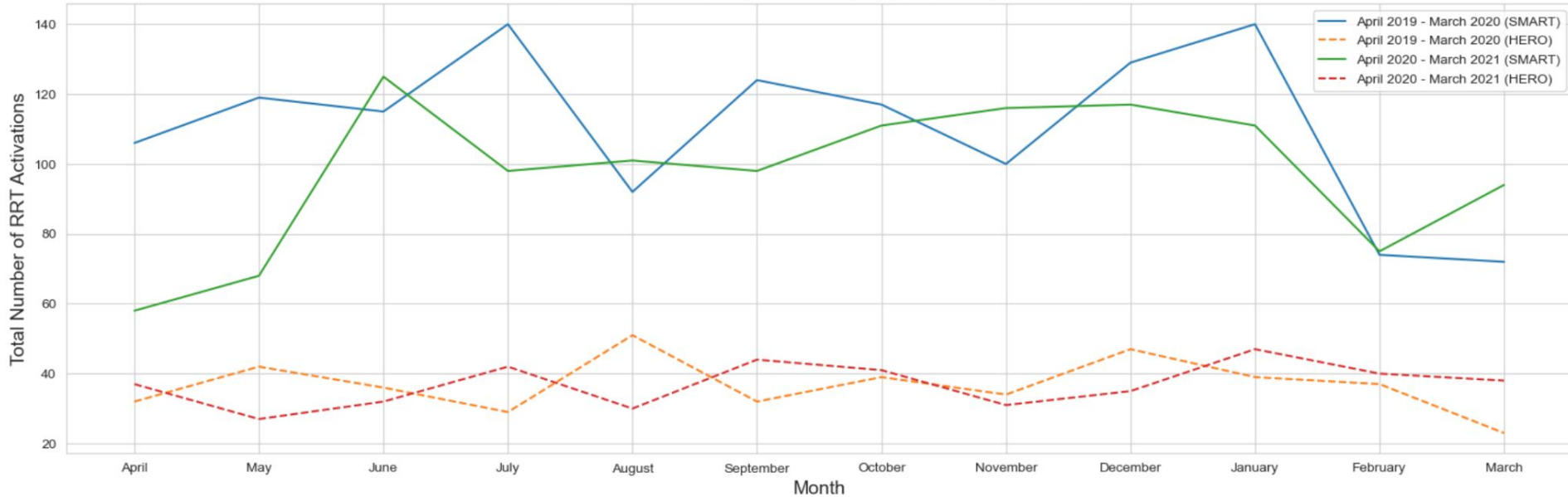
03. Exploratory Data Analysis – Total Number of RRT Activations by Teams and Month

authorized_date_time	document_name	count	team	month	year
2019-04	MICU Triage Note SGH	106	SMART	April	2019
	SICU Triage Note SGH	32	HERO	April	2019
2019-05	MICU Triage Note SGH	119	SMART	May	2019
	SICU Triage Note SGH	42	HERO	May	2019
2019-06	MICU Triage Note SGH	115	SMART	June	2019
	SICU Triage Note SGH	36	HERO	June	2019
2019-07	MICU Triage Note SGH	140	SMART	July	2019
	SICU Triage Note SGH	29	HERO	July	2019
2019-08	MICU Triage Note SGH	92	SMART	August	2019
	SICU Triage Note SGH	51	HERO	August	2019
2019-09	MICU Triage Note SGH	124	SMART	September	2019
	SICU Triage Note SGH	32	HERO	September	2019
2019-10	MICU Triage Note SGH	117	SMART	October	2019
	SICU Triage Note SGH	39	HERO	October	2019
2019-11	MICU Triage Note SGH	100	SMART	November	2019
	SICU Triage Note SGH	34	HERO	November	2019
2019-12	MICU Triage Note SGH	129	SMART	December	2019
	SICU Triage Note SGH	47	HERO	December	2019
2020-01	MICU Triage Note SGH	140	SMART	January	2020
	SICU Triage Note SGH	39	HERO	January	2020
2020-02	MICU Triage Note SGH	74	SMART	February	2020
	SICU Triage Note SGH	37	HERO	February	2020
2020-03	MICU Triage Note SGH	72	SMART	March	2020
	SICU Triage Note SGH	23	HERO	March	2020

2020-04	MICU Triage Note SGH	58	SMART	April	2020
	SICU Triage Note SGH	37	HERO	April	2020
2020-05	MICU Triage Note SGH	68	SMART	May	2020
	SICU Triage Note SGH	27	HERO	May	2020
2020-06	MICU Triage Note SGH	125	SMART	June	2020
	SICU Triage Note SGH	32	HERO	June	2020
2020-07	MICU Triage Note SGH	98	SMART	July	2020
	SICU Triage Note SGH	42	HERO	July	2020
2020-08	MICU Triage Note SGH	101	SMART	August	2020
	SICU Triage Note SGH	30	HERO	August	2020
2020-09	MICU Triage Note SGH	98	SMART	September	2020
	SICU Triage Note SGH	44	HERO	September	2020
2020-10	MICU Triage Note SGH	111	SMART	October	2020
	SICU Triage Note SGH	41	HERO	October	2020
2020-11	MICU Triage Note SGH	116	SMART	November	2020
	SICU Triage Note SGH	31	HERO	November	2020
2020-12	MICU Triage Note SGH	117	SMART	December	2020
	SICU Triage Note SGH	35	HERO	December	2020
2021-01	MICU Triage Note SGH	111	SMART	January	2021
	SICU Triage Note SGH	47	HERO	January	2021
2021-02	MICU Triage Note SGH	75	SMART	February	2021
	SICU Triage Note SGH	40	HERO	February	2021
2021-03	MICU Triage Note SGH	94	SMART	March	2021
	SICU Triage Note SGH	38	HERO	March	2021

03. Exploratory Data Analysis

Total Number of RRT Activations by Month and Teams



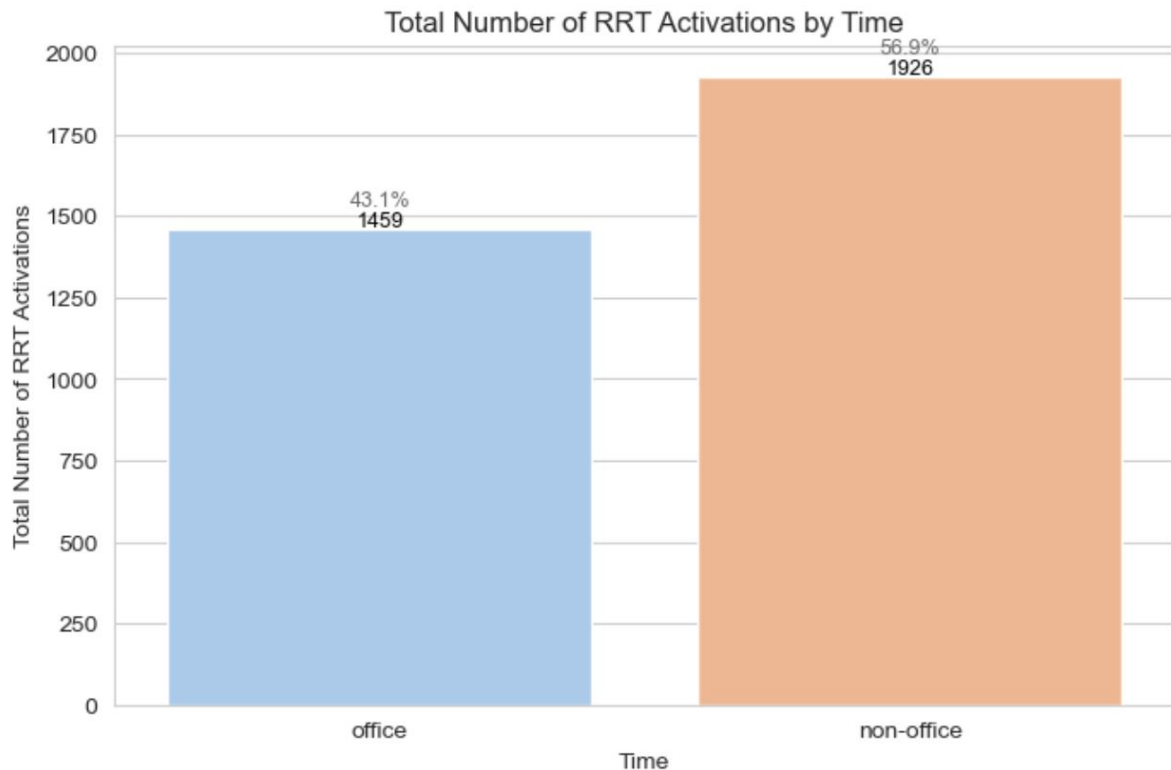
- There are generally more RRT activations by SMART team as compared to HERO team. As such, it contributes to the total activations to a larger extent.
- The fluctuations in RRT activations are greater for SMART team as compared to HERO team, with the range in the number of activations by SMART team at 82 and that of HERO team at 28.
- There is a somewhat similar trend in the total number of RRT activations across the two fiscal years by SMART team while that by HERO team is more erratic. As such, the conditions of the patients under the HERO team might be more unstable or the team might have [more reluctance in RRT activations](#) and require more training in it.

03. Exploratory Data Analysis - Total Number of RRT Activations by Time

	case_no	document_name	sgh_disposition	sgh_time_referred	authored_date_time	discharge_type_description	day_of_week	is_in_ph	hours
0	5690G	MICU Triage Note SGH	Iso ICU	2020-10-07 08:38:00	2020-10-07 10:06:00	Patient Discharged	2	False	office
1	4269F	MICU Triage Note SGH	GW	2020-12-28 16:04:00	2020-12-28 17:02:00	Follow-up at SOC	0	False	non-office
2	1225E	MICU Triage Note SGH	GW	2020-09-30 08:48:00	2020-09-30 09:07:00	Follow-up at SOC	2	False	office
3	6166C	MICU Triage Note SGH	Iso ICU	2021-03-11 02:55:00	2021-03-11 03:50:00	Death	3	False	non-office
4	6166C	MICU Triage Note SGH	MICU	2019-05-22 15:43:00	2019-05-22 16:18:00	Death	2	False	office
...
3380	7861A	MICU Triage Note SGH	GW	2019-08-11 01:30:00	2019-08-11 03:28:00	Follow-up at SOC	6	True	non-office
3381	8404B	MICU Triage Note SGH	MICA	2019-06-23 08:43:00	2019-06-23 09:57:00	Follow-up at SOC	6	False	non-office
3382	8404B	MICU Triage Note SGH	MICA	2019-07-31 15:00:00	2019-07-31 20:52:00	Follow-up at SOC	2	False	non-office
3383	1049E	MICU Triage Note SGH	MICA	2019-04-09 15:24:00	2019-04-09 15:23:00	Death	1	False	office
3384	1049E	MICU Triage Note SGH	MICU	2019-04-22 09:58:00	2019-04-22 09:56:00	Death	0	False	office

3385 rows x 9 columns

03. Exploratory Data Analysis



- There are more RRT activations during non-office hours (56.9%) than office hours (43.1%). Below are a few plausible reasons:
 - Non-office hours are proportionally longer than office hours in a day.
 - There is less manpower in the hospital during non-office hours, resulting in patient deterioration not being recognized and responded to in a timely manner and subsequent RRT activations.

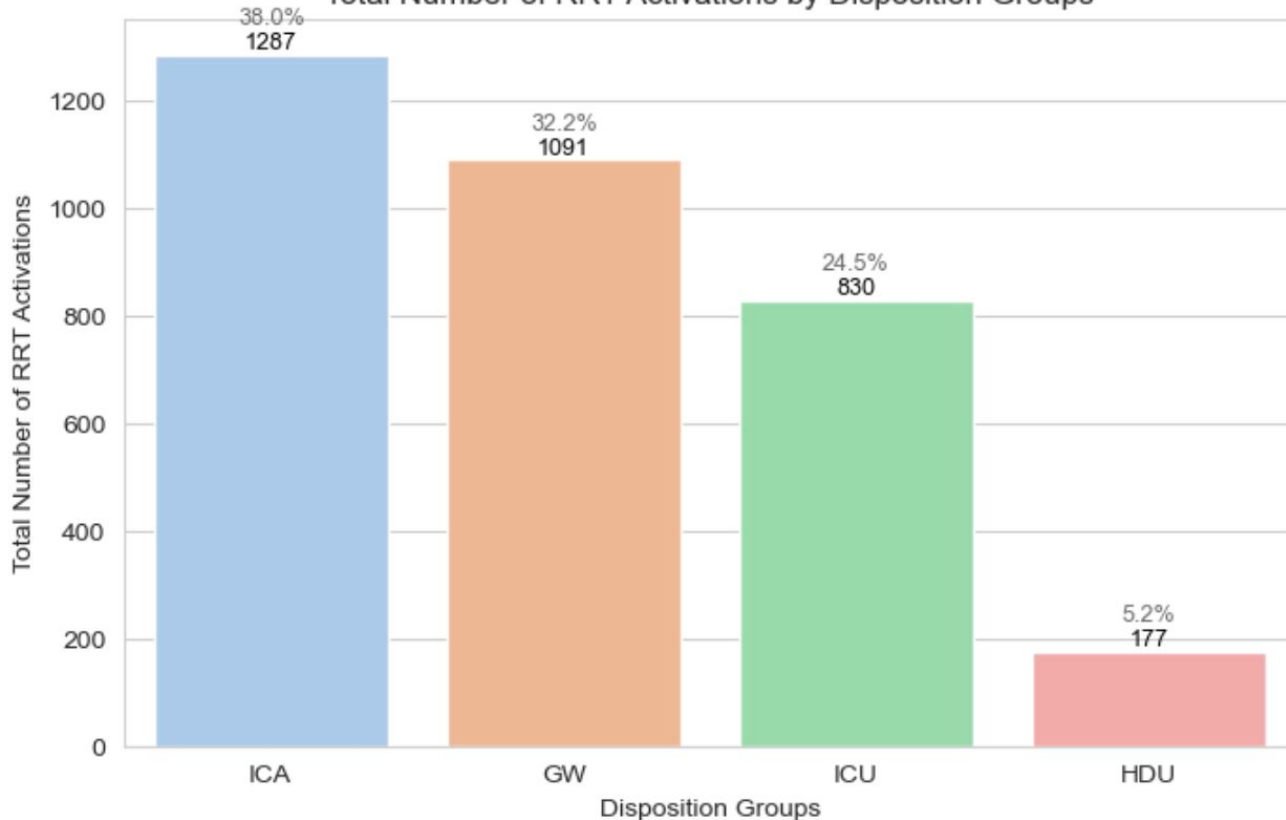
03. Exploratory Data Analysis - Total Number of RRT Activations by Disposition

	case_no	document_name	sg_h_disposition	sg_h_time_referred	authored_date_time	discharge_type_description	disposition_group
0	5690G	MICU Triage Note SGH	Iso ICU	2020-10-07 08:38:00	2020-10-07 10:06:00	Patient Discharged	ICU
1	4269F	MICU Triage Note SGH	GW	2020-12-28 16:04:00	2020-12-28 17:02:00	Follow-up at SOC	GW
2	1225E	MICU Triage Note SGH	GW	2020-09-30 08:48:00	2020-09-30 09:07:00	Follow-up at SOC	GW
3	6166C	MICU Triage Note SGH	Iso ICU	2021-03-11 02:55:00	2021-03-11 03:50:00	Death	ICU
4	6166C	MICU Triage Note SGH	MICU	2019-05-22 15:43:00	2019-05-22 16:18:00	Death	ICU
...
3380	7861A	MICU Triage Note SGH	GW	2019-08-11 01:30:00	2019-08-11 03:28:00	Follow-up at SOC	GW
3381	8404B	MICU Triage Note SGH	MICA	2019-06-23 08:43:00	2019-06-23 09:57:00	Follow-up at SOC	ICA
3382	8404B	MICU Triage Note SGH	MICA	2019-07-31 15:00:00	2019-07-31 20:52:00	Follow-up at SOC	ICA
3383	1049E	MICU Triage Note SGH	MICA	2019-04-09 15:24:00	2019-04-09 15:23:00	Death	ICA
3384	1049E	MICU Triage Note SGH	MICU	2019-04-22 09:58:00	2019-04-22 09:56:00	Death	ICU

3385 rows x 10 columns

03. Exploratory Data Analysis

Total Number of RRT Activations by Disposition Groups



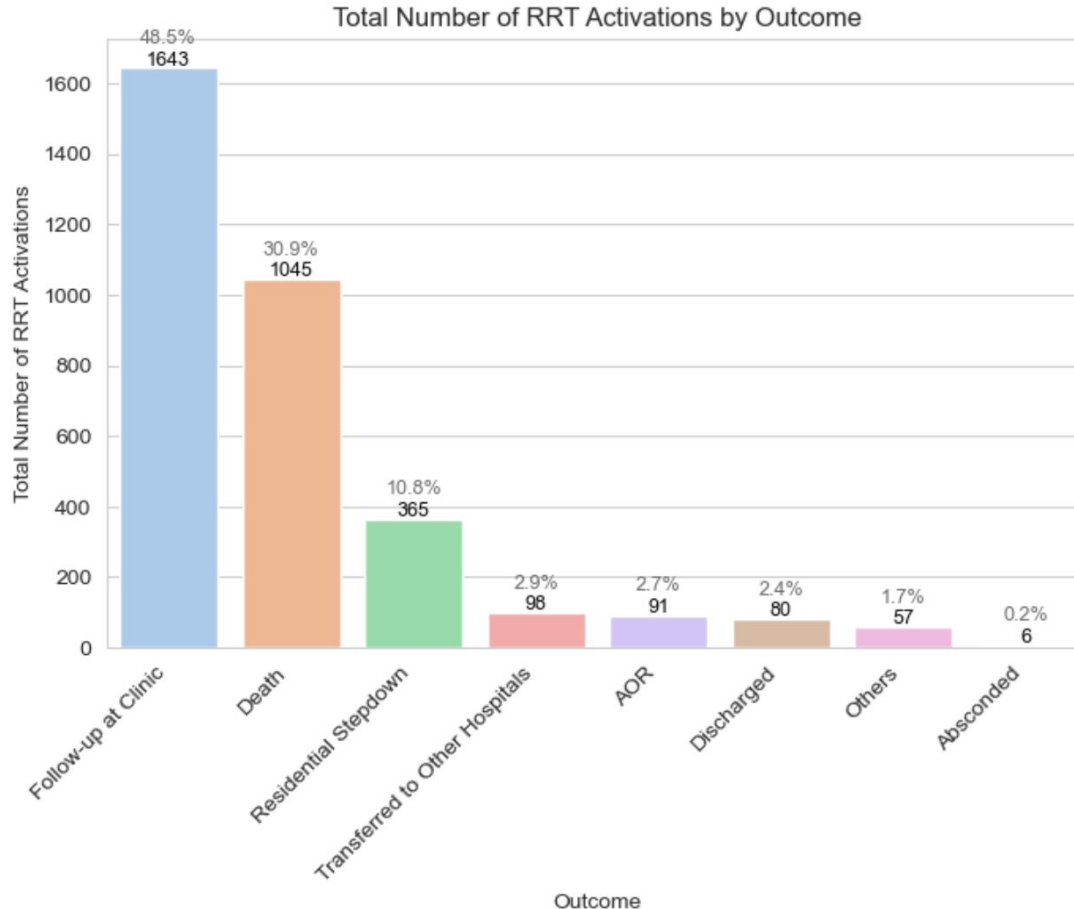
- Most of the disposition of patients after being seen by either the SMART team or HERO team is to the ICA (38.0%), followed by GW (32.2%), ICU (24.5%) and HDU (5.2%).
- There are seven subgroups under ICA while there is only one subgroup under GW, so the subgroup of GW is already a big subgroup by itself.
- More training might have to be provided in terms of early detection of deterioration of health conditions linked to ICA and GW cases to lower the related RRT activations.

03. Exploratory Data Analysis - Total Number of RRT Activations by Outcome

	case_no	document_name	sgh_disposition	sgh_time_referred	authored_date_time	discharge_type_description	outcome
0	5690G	MICU Triage Note SGH	Iso ICU	2020-10-07 08:38:00	2020-10-07 10:06:00	Patient Discharged	Discharged
1	4269F	MICU Triage Note SGH	GW	2020-12-28 16:04:00	2020-12-28 17:02:00	Follow-up at SOC	Follow-up at Clinic
2	1225E	MICU Triage Note SGH	GW	2020-09-30 08:48:00	2020-09-30 09:07:00	Follow-up at SOC	Follow-up at Clinic
3	6166C	MICU Triage Note SGH	Iso ICU	2021-03-11 02:55:00	2021-03-11 03:50:00	Death	Death
4	6166C	MICU Triage Note SGH	MICU	2019-05-22 15:43:00	2019-05-22 16:18:00	Death	Death
...
3380	7861A	MICU Triage Note SGH	GW	2019-08-11 01:30:00	2019-08-11 03:28:00	Follow-up at SOC	Follow-up at Clinic
3381	8404B	MICU Triage Note SGH	MICA	2019-06-23 08:43:00	2019-06-23 09:57:00	Follow-up at SOC	Follow-up at Clinic
3382	8404B	MICU Triage Note SGH	MICA	2019-07-31 15:00:00	2019-07-31 20:52:00	Follow-up at SOC	Follow-up at Clinic
3383	1049E	MICU Triage Note SGH	MICA	2019-04-09 15:24:00	2019-04-09 15:23:00	Death	Death
3384	1049E	MICU Triage Note SGH	MICU	2019-04-22 09:58:00	2019-04-22 09:56:00	Death	Death

3385 rows x 11 columns

03. Exploratory Data Analysis



- The top three outcomes from RRT activations are follow-up at clinic (48.5%), followed by death (30.9%) and residential stepdown (10.8%).
- As such, measures have to be put in place to ensure proper handover to subsequent clinics and specialists so that patients are well-taken care of and prevent duplication of efforts.
- Since death constitute to a fairly large proportion of the outcomes (30.9%), more training have to be conducted to improve the effectiveness of the RRT activations and efficiency of early detection in deterioration of health conditions.
- Similarly, measures have to be put in place in ensure proper handover to residential stepdown facilities so that patients' conditions do not worsen.

THANK YOU

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