



## COVID-19: Transformation of an Indian multispecialty centre into a dedicated corona-care institution in the lockdown era

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### ABSTRACT

**Background:** The Covid-19 pandemic with unprecedented increased influx of patients proved strenuous for the already overburdened healthcare infrastructure. It was important that the existing centres, especially in developing countries, take up the challenge.

**Aim:** To study the differential functioning and transformed triage management protocol in an Indian multispecialty hospital during the covid-19 'lockdown' frame from March 29–June 01, 2021.

**Materials and methods:** Multiple departments in the hospital were integrated to identify clinical characteristics and comorbidities for triage. Separate corona outdoor in addition to routine OPD and emergency services was created for influx of suspected patients according to symptomatic severity. Further inter-ward transfer of patients was planned based on patient's clinical severity and covid status. This was executed inclusively with least compromise to renal, haemophilic or chemotherapy day-care interventions.

**Results:** Out of 2791 patients studied, 690 were admitted through dedicated corona outdoor and 2101 through emergency. Respiratory distress (966) was the highlight in majority followed by multisystem involvement (795). Hypertension (675) and diabetes (406) were common comorbidities. Hospital stay was longer in patients with comorbidities averaging 4.3 days for both covid and non-covid cases altogether. Maximal covid positives (46.05%) were detected in earmarked observation wards created to reduce exposure. The condition worsened in 104 suspects from ARI thus shifted accordingly. Out of 1201 patients transferred, maximum were

from ARI (63.4%) with total 1301 discharges overall post cure and 637 mortalities.

**Conclusion:** This system enhanced inter-departmental cooperation and performance to deal the pandemic, achieved through triage and treatment by training personnel into different roles.

**Keywords:** Coronavirus, pneumonitis, wards, pandemic, covid.

### I. INTRODUCTION

In a world drenched with vigour, the "Coronavirus" or "COVID-19" pandemic has put the brakes on almost all activities. Emanating from Wuhan in China in December 2019, the virus rampaged across the globe affecting more than 4.5 million people and causing 300 thousand deaths as of May 15, 2020.<sup>1</sup> This event although, has roots in recent past when congener viruses namely SARS (January 2002) and MERS (April 2012) wreaked havoc causing fatalities at rates of 9.4% and 34.4% respectively.<sup>2</sup> The World Health Organisation (WHO) labelled the ailment as a "public health emergency of international concern" on January 30, 2020 and eventually a "pandemic" on March 11, 2020.<sup>3</sup> In response, many countries such as led by European Union Initiative, elaborated specific centres for Covid-19, in order to create awareness and mitigate response.<sup>4</sup> In the Indian perspective, index case was reported in Thrissur, Kerala on January 30, 2020 while Rajasthan had its first on March 02, 2020. Currently, SARS-COV-2 has affected 10 million people with 1.5 lac deaths in India till date with figures rising every moment.<sup>5</sup> The virus has betacoronavirus 2b lineage, with a fatality rate estimated around 2%, much meagre than its counterparts, but due to its rampant



transmissibility of  $R_0$ -2.5 (reproductive number, magnitude of infectious state), it has become a global emergency.<sup>6</sup>

In the current scenario when the nation lacks an “effective” vaccine strategy, a mechanised protocol based management is essential especially when the country is weighed down by the population density of a massive 464 per km<sup>2</sup> while per capita income is Rs.24/day; thereby making proper tertiary care of the ailing a far cry.<sup>7</sup> The hospital premise, in usual times also deal with hoards of patients on regular basis, but this has been an unseen affair, where the masses have to be treated with adequate distancing and careful precautions to prevent imminent transmission, with management of all without compromise.

In such devastating times, many government run institutions like ours have worked day in and out to be up to the challenge, by prioritising integrated protocol based treatment of the victims, triaging them into mild, moderate and severe acute respiratory illness patients, as per Indian Council of Medical Research (ICMR) guidelines<sup>8</sup> and dealing them separately with corresponding resources, while laying out awareness regarding Omass prevention.

This study aimed at amalgamating the clinical characteristics, pre-existing comorbidities, standard of procedure (SOP) for inter-ward transfer, treatment protocol and outcome of corona suspects in a tertiary care centre and emphasising the importance of early triage, accurate reporting and management.

## II. METHODOLOGY

The study is a hospital based descriptive study conducted in SawaiMansingh Hospital (SMS), Jaipur, India during the corona pandemic lockdown from March 29 to June 01, 2021. The entire tertiary care multispecialty hospital, comprising of various medico-surgical and super-specialty branches with combined number of around 31,42,052 outpatients and 2,22,137 admissions in year 2019.<sup>9</sup> This thriving centre was transformed overnight into a single “corona-care institution”, where all branches functioned as a single unit with teams of health personnel from every strata of the medical diversity. Major departments were integrated and all available wards were earmarked, thoroughly fumigated and intensified, as per ICMR guidelines<sup>8</sup>, to tackle the pandemic. All Intensive Care Units (ICUs) in the premise were duly cleansed and carefully designated for different categories based on clinical and covid status.

### Corona-suspects

Patients showing up at Corona OPD were filtered as per symptomatology and suspects, especially from hotspot areas were admitted to observation wards for corona testing of dual nasopharyngeal-throat swab sample by RT-PCR technique (real time reverse transcriptase-polymerase chain reaction) utilising the RNA isolation kit. A repeat sampling was done for negatives to ensure safety whereas a positive result warranted an immediate transfer to dedicated corona wards or Infectious Disease Hospital (IDH), subunit of SMS, Jaipur.

Asymptomatic suspects rested in corona observation ward. Furthermore, any patient exhibiting respiratory symptoms was admitted to Acute Respiratory Illness (ARI) ward and these patients from ARI ward, with awaited covid status needful of ventilation were shifted to Severe ARI (SARI). This was treated as transit ICU for suspicious cases and further transfers were planned depending on covid reports.

The patients, according to the severity, were allocated differently post a positive report to specifically modified covid-positive wards (mild/asymptomatic) or earmarked covid ICU setups if requiring O<sub>2</sub> support with possibility of requiring mechanical ventilation.

Repeat testing was mandatory for all admitted patients every 3<sup>rd</sup> day, with positives continuing hospital stay and asymptomatic individuals discharged after 2 consecutive negative results followed with home/centre quarantine for 14 days. Later revised sampling was done on the 5<sup>th</sup> and 9<sup>th</sup> days as per guidelines.<sup>10</sup>

Separate Mucormycosis wards and OPD was established to deal with the sudden influx in the latter half of the study premise with dedicated departmental allocation for operative and symptomatic care. Treatment protocol (ICMR) was followed to manage symptomatic patients with therapeutic interventions involving antiretroviral combination of lopinavir-ritonavir was used, as per “WHO Solidarity trial”<sup>11</sup> with therapeutic ‘Remdesivir’ and injectable steroids being given as per routine protocol, given to positive patients and their clinical outcomes and benefits were thoroughly documented.

### Non-suspected patients

General non-suspect patients were screened and admitted into separate medical wards ensuring no compromise in the care deserved. All specialities worked simultaneously to strengthen the corona unit. Few patients who exhibited protean manifestations of covid from medicine, surgery and cardiology departments and later showing covid



positive status were shifted to IDH and duly included in the study.

Patients were followed daily for vitals, major events and complications viz. acute renal injury, heart failure, arrhythmia, shock and death during hospital stay. Adjunct routine investigations like blood counts, serial ECG, HRCT thorax, hepatic, renal and coagulation profile were performed.

#### Speciality specific patients

Patients, who endured emergency morbidities like acute MI, cerebrovascular accidents, hepatic encephalopathy or acute surgical abdomen viz. perforation or strangulated hernia, were dealt separately by the respective departments in priority, taking complete aseptic precautions post urgent covid report, if needed. Trauma branch functioned individually to handle fractures-dislocations and life threatening traumatic events, including all accidental emergencies, performing relevant procedures if required.

Although all possible elective procedures were deferred but imminent ones viz. maintenance haemodialysis were stationed in a separate constituent hospital to ensure continuous management. Haemophilia prophylaxis was dealt on day care basis and those requiring transfusion were duly obliged. However, physiotherapy setup was a bit hampered but they continued their services via online instructions and issuing of relevant handicap certificates. Other specialties worked with minimal staff and faculty was allocated to administrative work and planning.

Data was collected regarding the variable clinical presentations of 2791 patients till date (up to the time when our institution was planned for re-functioning in wake of 'Indian Unlock' by June in defined phases), their triage, management and outcome.

### III. OBSERVATIONS

The study involved a total of 2791 cases admitted to SMS in its various constituent centres earmarked separately for varied functions as aforementioned. These patients were channelized as per their clinical characteristics, their covid status depending upon the need for critical care and were traced upto final outcomes.

Table 1 indicates the clinical profile of cases with maximum admissions in general medicine wards (1465) out of which respiratory compromised dominating all cases. Majority (50.8%) were shifted there from ARI ward after a negative covid report. This may be explained with the fact that ARI was the second major contributor of patients to medicine wards, after emergency. Out of

1465, about 334 had multisystem involvement with another 388 having shock, carcinomas and other miscellaneous diseases. ARI ward performed similarly with 310 respiratory and 367 multisystem comorbid cases. Most common associated comorbidity was hypertension overall followed by diabetes. SARI ward which was earmarked for covid suspects with severe symptoms got majorly 198 cases of bilateral pneumonitis, with septic shock as adjunct, with most showing diabetic (41) and hypertensive (49) trails. IDH was kept as isolation facility for covid positives, showing multiple systems affected with respiratory failure indulging 213 patients, 91 of whom having superadded comorbidities. Patients admitted in other specialties were also included in this analysis with 218 cases with 94 having lung involvement, apart from specialty-specific comorbidity, with a mean hospital stay of 3.3 days with and 2.8 days w/o comorbidity respectively. Confirmation of covid status was seen maximally in observation ward (46%) as expected. Besides that the transformation of institutional functioning was fruitful as with ARI and SARI working simultaneously, many symptomatic positives were identified with covid positivity rate of 5% in ARI and 8.6% in SARI.

Mean ward stay varied with maximum being 9.8 days in symptomatic covid positives in IDH with adjoining comorbidities and minimum being 1.67 days in symptomatic suspects transferred post negative report from SARI. This occurred with SARI being a transit ICU for HDUs which served as final destination post covid status. In other units, ARI averaged 3.4 days while patients stayed for mean 5.9 days in medicine wards. The stay was more in those with comorbidities in all wards compared to ones without them.

Table 2 shows the inter-ward transfer of patients as per the institutionalised protocol to channel the patients. Inflow of patients with unique central registration number includes 2101 patients from emergency and 690 from dedicated corona OPD which were further transferred to various categorised wards as per proposed flow based on clinical severity and covid status (Figure 1). A major portion from former got into general medicine wards in wake of absent radiologic evidence of any lung involvement while 803 had respiratory symptomatology, out of which 104 required critical care setups. Of all 213 symptomatic positives, 102 patients from dedicated IDH, following negative report were transferred to specified covid wards. Non-suspected general patients viz. 68 cases with ventilation needs were



shifted to high dependency units (1, 2 or 3) as per the SOP. Additionally, minor percentage viz. 16 cases from medicine wards got transferred to the concerned super-specialties for specified management and vice versa where, 3 cases, 2 of stroke and one of MI, detected positives were shifted to IDH.

Table 3 indicates the final fate of the admitted patients, describing majority getting discharged from medicine (409) and observation wards (600) post negative report. In wake of extensive efforts by the health personnel, 648 from ARI and 68 from SARI were treated and shifted to respective wards post reported negative. The hospital used efficient corridors to transfer patients safe and sound to different locations, using strategized protocol, right from admission, evident by high percentage viz. 70% from ARI and 34.2% from SARI having subsequent transfers, once treated and as per covid reports. It involved giving thought to comorbidities associated involving multiple systems along with respiratory compromise, causing demise of 19% cases from ARI and 15.6% from medicine wards. Similarly, patients were shifted to other super-specialties as per need after achieving covid negative e.g. 87 cases with renal failure aptly transferred to the nephrology wing.

Unfortunately, many succumbed to these horrid times with 230 from wards, 178 from ARI and 124 from SARI losing their lives. It was observed that maximal cases out of these had pre-existing comorbidities that worsened their prognosis. About 1,68,400 covid tests were performed during the time span of this study including majorly all patients except those showing minimal or rare presentation of covid who escaped through our sieve.

These statistics signify how intricate and elaborate this institutionalised hierarchy functioned, not only to accurately monitor the condition but also the channelling of cases to ensure as uninterrupted and proper treatment as possible.

#### IV. DISCUSSION

In this study regarding the variant functioning of our multispecialty hospital in the pandemic times, the singular goal was to reflect on the rationale, the impact and the potential of this type of unprecedented changeover that not only revolutionised the face of the centre but also proved useful for optimum patient care.

Covid-19 produced variable clinical presentations of patients that needed correct stratification in view of primary condition and

prognosis, which otherwise could have proven disastrous. Litewka SG et al<sup>12</sup> elaborated the turmoil in Venezuelan healthcare system, which due to degraded resources and poorly made containment centres, causing 53.3% mortalities out of total 1330 cases, irrespective of covid status nationwide in 14 days which compared to our scenario is dire, owing to meagre 21% deaths in one particular centre keeping in mind the enormous input of 2791 patients.

The Malawi Emergency and Critical Care survey (MECC)<sup>13</sup> showed the world with an example how a tertiary care centre with a functional emergency department was created overnight, with meagre resources, flourishing inward and outdoor services using just 101 clinical staff and 304 beds in a background of no infrastructure earlier. In comparison, our hospital had a staff of over 1000 that were allocated differently into integrated services, which had to deal with differential functioning apart from managing the enormous usual patient load.

To put this in perspective, Beysard N, Yersin B et al<sup>14</sup> examined the impact of 2015 influenza on functioning of emergency department in a tertiary centre, correlating it with mean hospital stay. Patients were subjected to mandatory nasal swab testing, where they found 2.2% positives among 28% bed occupancy rate in specified respiratory illness wards with other wards functioning normally, in contrast to our proposition where about 90% of total beds were allocated with 20.51% positives given adequate treatment post diagnosis. This was the result of magnanimous transformation of our centre that with early diagnosis helped to flatten out the curve and increase the patient doubling time gradually over time without which the conditions would have been worse. All patients (100%) with confirmed covid were hospitalised and segregated as per vital requirements compared to 55.9% in the aforementioned study. Further, the mean ward stay in our study, in observation wards was about 3.7 days for asymptomatic and 4.3 days for symptomatic depending upon the associated comorbidities in contrast to their emergency department mean stay of 24.7 hours and 21.6 hours respectively, dramatically increasing the workload.

The clinical profile studied by Wang D, Hu B et al<sup>15</sup>, in their analysis of 138 hospitalised patients with coronavirus-infected pneumonia in Wuhan, China showed 64 with multiple comorbidities leading to 25% cases requiring ICU admissions. In our centre, out of 2791 hospitalised patients, 2337 had comorbidities and 18.3% were admitted in ICU. Our hospital had just 220





electives surgeries and 1802 other procedures in entire lockdown as opposed to more than 15,000 ones in an equal time period prior to that, owing to the fact that entire machinery functioned in variable corona duties, differently.

The hospital thereby had multiple areas of planning progressing simultaneously which focussed on infection control, clinical operational challenges, ICU management, staffing, ethics and maintenance of staff wellbeing. In New York Presbyterian Hospital, protocols were developed for intubation, use of high flow oxygen, infectious disease consultation using technology to minimise staff exposure, encompassing a standardised protocol, which involved testing all patients attending outdoor and inpatient services with the symptoms and signs of the infection. This was supplemented with tracking and home quarantining the respective positives and negatives once report was declared. Many of these measures are in concordance with those taken in our hospital viz. Healthcare personnel (HCP) in whom exposure was minimised using shift based duties and high quality PPE Kits, along with mandatory covid testing of HCP with ensuring rapid test results. Tracking and identification of hotspot areas were carried out by PSM department and rapid response teams were thereby constructed. To keep our HCP in high spirits, recreational activities including yoga and laughter sessions were organised.

To conclude, it can be said that apt and quick integrated decisions can make an overnight shift in one of the biggest healthcare systems of the nation that showed solidarity in patient dealing, all over the lockdown event.

## V. CONCLUSION

The Covid-19 pandemic proved to be a critical question for both underdeveloped and developing nations with overstressed existing public healthcare infrastructure. India, being a country with on-going fights of eternal conquest with vector-borne diseases, community acquired ailments, tubercular etiologies and high population density vulnerable for community spread, containing the disease was a tough task. But in these times of global crisis also, proper orientation despite of mild allocation has reaped unexpected results. The study established that use of evidence-based strategies to contain the virus and strengthen the hospital capacity to care for the victims, accounted for reduced mortalities which otherwise would have toppled all historical records in regards of pandemic-induced destruction.

In longer term, fundamental lessons to be learnt from this analysis include building proper mathematical models on assumptions and observations that predicted apocalyptic numbers, to act accordingly in order to contain our tryst with such transmissions.

## DECLARATION OF CONFLICT OF INTEREST

The author declares absence of any conflict of interest

## FUNDING

No cost was born by anyone with no grant/funding sought as all the differential functions were allocated as per institutional protocols.

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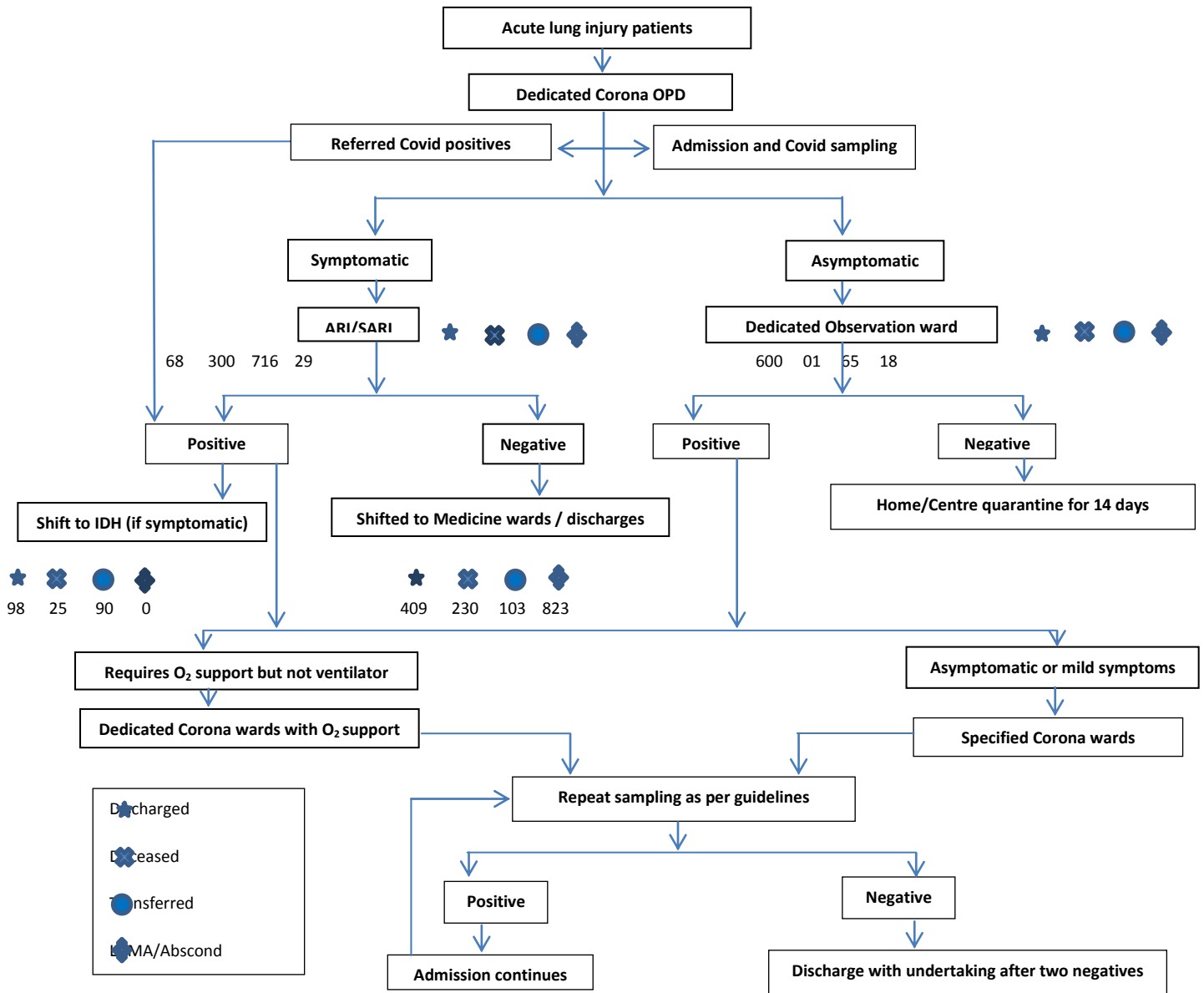


Figure 1: Institutionalised protocol for transfer and subsequent outcome of patients



Ward Designation	No. of patients received (M/F)	System involved of presenting complaints						Comorbidity associated					Covid Positive	Mean ward stay(days)	
		Resp	GIT	CVS	CNS	Multisystem	Others	DM	HTN	CAD	CKD	Others		with CM	w/o CM
Medicine Wards	1465 (895/570)	284	100	159	200	334	388	151	217	60	59	189	2	5.9	4.1
Observation Wards	684 (457/227)	202	41	20	9	5	407	78	109	41	12	32	315	2.4	1.6
ARI Ward	915 (556/359)	310	35	34	32	367	127	86	231	65	105	226	46	3.4	2.3
SARI	198 (105/93)	112	13	7	15	25	26	41	49	10	15	58	17	1.67	2.5
IDH Isolation Ward	213 (118/95)	40	5	6	3	24	135	24	30	11	8	18	213	9.8	7.2
Other wards/specialties	218 (125/93)	94	52	9	4	21	38	19	22	9	44	37	2	3.3	2.8
High Dependency Units	88(56/32)	24	2	3	19	19	21	7	17	3	6	32	1	3.6	5.9

**Table 1: Clinical profile of the patients(CM: Comorbidities)**

Place of Initial admission	No. of patients received (M/F)	Received Admissions						
		Medicine Wards	Observation Wards	ARI	SARI	IDH	HDU	Superspecialities
Emergency	2101 (1295/806)	1157	0	803	89	0	11	41
Corona OPD	690 (387/303)	0	519	112	0	51	8	0
ARI Ward	915 (556/359)	465	9	0	104	19	3	26
SARI	198 (105/93)	12	0	0	0	13	26	3
IDH Isolation Ward	213 (118/95)	0	102	0	0	0	8	29
Medicine Wards	1465 (895/570)	0	0	14	5	0	68	16

**Table 2: Inter-ward transfer of patients**

Ward Designation	No. of patients received (M/F)	Outcome Of Patients n(%)							
		Discharges		LAMA/Abscond		Transfer to wards/ICUs		Death	
		with CM	w/o CM	with CM	w/o CM	with CM	w/o CM	with CM	w/o CM
Medicine Wards	1465 (895/570)	171(11.3)	238(16.2)	274(18.7)	449(30.6)	64(4.3)	39(2.6)	147(10)	83(5.6)
Observation Wards	684 (457/227)	229(33.4)	371(54.2)	4(0.5)	14(2)	12(1.7)	53(7.7)	1(0.6)	0
ARI Ward	915 (556/359)	51(5.5)	17(1.8)	17(1.8)	6(0.6)	530(57.9)	118(12.8)	164(17.9)	12(1.3)
SARI	198 (105/93)	0	0	5(2.5)	1(0.5)	38(19.1)	30(15.1)	69(34.8)	55(27)
IDH Isolation Ward	213 (118/95)	34(15.9)	64(30)	0	0	20(9.3)	70(32.8)	24(11.2)	1(0.4)
Other wards / specialties	218 (125/93)	84(38.5)	38(17.4)	24(11)	17(7.7)	15(6.8)	9(4.1)	26(11.9)	5(2.2)
High Dependency Units	88(56/32)	2(2.2)	2(2.2)	6(6.8)	3(3.4)	11(12.5)	12(13.6)	33(37.5)	17(19.3)

**Table 3: Outcome of patients**