Hypo-arousal and Hyper-arousal Delirium in Hospitalized Patients with COVID-19: A Chart Review Study

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Background

- COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020.
- The illness's main symptoms involve respiratory and gastrointestinal systems, along with constitutional symptoms as fever and chills.
- The illness has also been associated with neurological and psychiatric symptoms (including delirium) in a subset of patients.
- Clinically, delirium could be subcategorized into hyper-arousal and hypo-arousal based on arousal status.
- University Hospital of Brooklyn (UHB) was designated as a COVID-19 only facility from March 28th, 2020, to June 5th, 2020, and central Brooklyn was the epicenter of the COVID-19 in the United States during much of this period.

Method

- **Design:** Retrospective review of electronic medical records of patients with primary diagnosis of COVID-19 admitted to UHB from March 12th, 2020, to May 1st, 2020. (Check Algorithm 1 for full process of chart review)
- **Inclusion Criteria:** We included patients who were:
  1. ≥ 18 years old
  2. of both sexes
  3. COVID-19 diagnosis (using reverse transcriptase PCR sampled from nasopharyngeal specimen)
- The study was approved by the Institutional Review Board of State University of New York (SUNY) Health Sciences University
- Data analyzed with SAS version 9.4

Results

Variable	Hypo-arousal N = 201	Hyper-arousal N = 30	p value
Male*	115 (57.2)	18 (60)	0.84
Ethnicity (Black/Others)*	182 (90.5)/ 7 (3.5)	26 (86.67)/ 1 (3.33)	0.75
Disorientation*	87 (54.7)	6 (25)	0.0081
Age**	74 (66-82)	69.5 (63 – 78)	0.05
Body Mass Index (BMI)**	26.3 (22.5 – 30.25)	29.7 (26.6 - 33)	0.0106
Serum Creatinine**	2 (1.3 – 3.5)	1.5 (1.1 – 2.3)	0.0377
Random Blood Sugar on admission**	177 (118 – 284)	137.5 (118.5 – 171.5)	0.0361
Oxygen Saturation nadir**	87 (75 – 92)	75 (70 – 88)	0.0367

* Variables summarized with frequency and percentage, and compared across groups with Fisher Exact Test
** Variables summarized with median and 25th- 75th percentile and compared across groups with Mann-Whitney U test
N = number of subjects

Algorithm 1
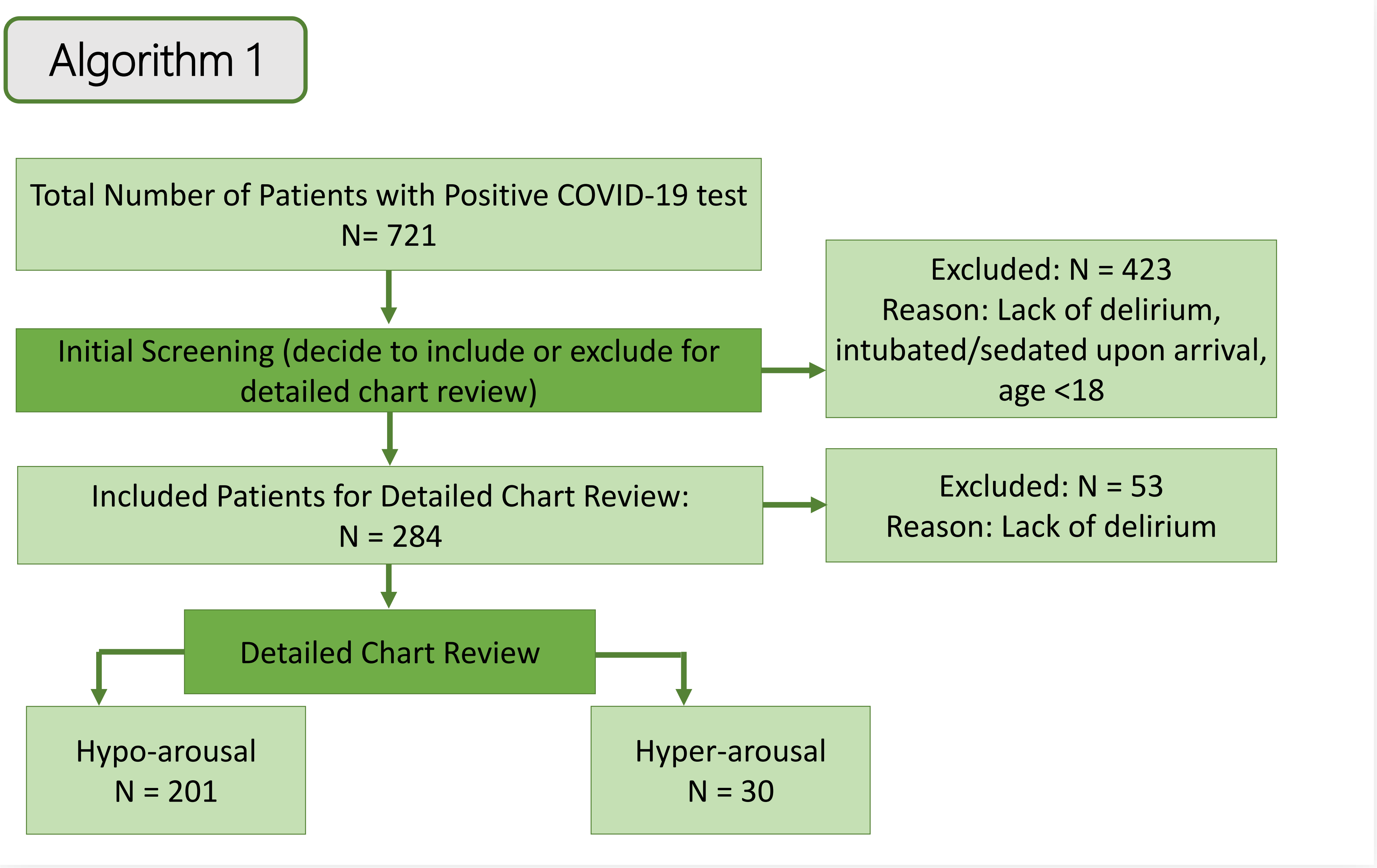
Discussion & Conclusion

- There is **high prevalence of delirium (32%)** in hospitalized patients with COVID-19 illness in an inner-city hospital serving a predominantly African American socially disadvantaged community.
- **Most patients developed hypo-arousal delirium (87%)**.
- Different clinical characteristics were found for hyper-arousal vs hypo-arousal delirium. The significance of the difference in clinical presentation is not well understood warranting the need for further prospective clinical research.
- Further research is needed to determine difference in long-term outcome between hyper-arousal and hypo-arousal groups.

Limitations

- Since our study is a **retrospective chart review**, no delirium scales were administered in a systematic manner.
- Findings need to be replicated in a different sample.

References

- Cucinotta, D., & Vanelli, M. (2020). WHO Declares COVID-19 a Pandemic. *Acta Biomed, 91*(1), 157-160. doi:10.23750/abm.v91i1.9397
- Han, J. H., Hayhurst, C. J., Chandrasekhar, R., Hughes, C. G., Vasilevskis, E. E., Wilson, J. E., . . . Ely, E. W. (2019). Delirium's Arousal Subtypes and Their Relationship with 6-Month Functional Status and Cognition. *Psychosomatics, 60*(1), 27-36. doi:10.1016/j.psym.2018.05.003
- Helms, J., Kremer, S., Merdji, H., Clere-Jehl, R., Schenck, M., Kummerlen, C., . . . Meziani, F. (2020). Neurologic Features in Severe SARS-CoV-2 Infection. *N Engl J Med, 382*(23), 2268-2270. doi:10.1056/NEJMc2008597
- Helms, J., Kremer, S., Merdji, H., Schenck, M., Severac, F., Clere-Jehl, R., . . . Meziani, F. (2020). Delirium and encephalopathy in severe COVID-19: a cohort analysis of ICU patients. *Crit Care, 24*(1), 491. doi:10.1186/s13054-020-03200-1
- Rogers, J. P., Chesney, E., Oliver, D., Pollak, T. A., McGuire, P., Fusar-Poli, P., . . . David, A. S. (2020). Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic. Lancet Psychiatry. doi:10.1016/S2215-0366(20)30203-0

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