

COVID-19 in Eye Surgery: The Case of a University Hospital

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Abstract. Coronavirus epidemic has quickly become a global health threat. The ophthalmology department, like all other departments, have adopted resource management and personnel adjustment maneuvers. The aim of this work was to describe the impact of covid on the Ophthalmology Department of University Hospital “Federico II” of Naples. In the study logistical regression was used for a comparison between the pandemic and the previous period, analyzing patient features. The analysis showed a decrease in the number of accesses; reduction of the length of stay; and the statistically dependent variables are as follows: LOS, discharge procedures and admission procedure.

Keywords. Covid, Logistic Model, Ophthalmology department.

1. Introduction

The last months of 2019 was marked by the worldwide spread of a new coronavirus epidemic, with the first cases of infected patients found in a city in China [1] causing thousands of deaths worldwide. Worldwide, preventive measures have been taken through health protection campaigns, blockades, and restrictions at public meetings [2]. Several studies have shown that covid has been more dangerous for older people and with chronic diseases such as diabetes, hypertension, or respiratory syndrome [3]. Despite the containment measures the coronavirus pandemic has caused devastating morbidity and mortality, this is a very serious problem for hospitals [4]. As in all other hospital departments also most ophthalmic departments during the pandemic Covid has suspended clinical and operative elective procedures and limited its activities to emergency cases [5], also, health personnel were relocated to COVID-19 units to combat the pandemic. Ophthalmologists are at high risk of exposure to Covid virus due to the close contact with patients during examination because the virus splits through droplets produced by the oral cavity and the specialist must be very close to the patient’s face [6]. Different study techniques are used to study and analyze hospital flows [7-9] that have greatly innovated healthcare, along with the growth of knowledge in technology [10-13]

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and materials [14-16]. The most common are statistical techniques that analyze variables and study their correlation [17-19] including the variable LOS, length of stay [20,21].

This work aims to analyze how Covid-19 influenced the activities of the Department of Ophthalmology of the University Hospital "Federico II" of Naples (Italy).

2. Methods

Figure 1 shows all the information about patients admitted in the Ophthalmology Department of the University Hospital "Federico II". The work wants to conduct a polycentric study because it is in line with the analysis conducted by two previously published works in other two hospitals in Campania: University Hospital "San Giovanni di Dio e Ruggi d'Aragona" of Salerno [22] and the "AORN A. Cardarelli" of Naples [23].

Patient's information	
Gender	Male/Female
Age	
Date of admission and discharge	
Diagnosis Related Group (DRG) relative weight	
Mode of discharge	<ul style="list-style-type: none"> • Dead=1 • At home=2 • At healthcare residence=3 • Home hospitalization=4 • Voluntary=5 • Transferred to another hospital=6 • Transferred to another regime in the same hospital=7 • Transferred to a rehabilitation center=8 • Ordinary discharge with activation of integrated home care=9

Figure 1. Dataset features.

To assess time trends between 2019 and 2020 (before Covid-19 and during the pandemic), descriptive statistical analysis, using IBM SPSS Statistics v.28 were performed. The independent variable in this work is described by the year of hospitalization while the explanatory variables are represented by gender, age, LOS, relative weight DRG, admission procedure and mode of discharge. In order to study the goodness of the model of logistic regression the following variable ones are estimated: Odds Ratio, confidence interval and p-value.

3. Results

The statistical analysis performed shows that in the year the pandemic spread, the number of patients decreased because the number of non-emergency accesses decreased, and consequently so did the number of procedures. The results are shown in Table 1.

Table 1. Analysis results.

	Statistical analysis			Logistic Regression		
	2019	2020	p-value	OR	95% CI	p-value
	N= 189	N= 47				
Gender, male	75	20	0.003	0.907	0.466-1.764	0.774
Age (Mean)	58.6	59.7	0.575	1.007	0.989-1.026	0.452
LOS (Mean)	2.98	2.53	0.020	0.905	0.733-1.117	0.105
DRG relative weight (Mean)	1.31	1.21	0.419	0.450	0.172-1.181	0.351

Mode of discharge				< 0.001			
	2	187	47		1.369	-	1.000
	5	1	-		0.780	-	1.000
	6	1	-		-	-	-
Admission Procedure				< 0.001			
	Scheduled	42	14		1.447	0.695-3.012	0.324
	Emergency	10	-		-	-	-
	Scheduled with pre-hospitalization	137	33		-	-	0.999

In 2020, there is a decrease in the number of accesses and in particular a decrease in emergency LOS. The statistically dependent variables (p -value <0.05) are as follows: gender, LOS, discharge mode, and admission procedure. Logistic regression analysis showed no significance. OR values, calculated to estimate the probability of exposure among the variables, had values ≤ 1 for sex, LOS, relative DRG weight and voluntary discharge; while values > 1 for age, home discharge and admission procedure.

4. Discussion and Conclusion

Coronavirus disease has had a strong influence on all social and economic aspects of the world, in particular public health and it was necessary to adapt the hospital organization and resource management [24]. In the study we wanted to study the impact of covid on the Department of Ophthalmology of the University Hospital "Federico II". The analysis was carried out with the logistic regression technique and the results showed interesting points such as: a decrease in the number of accesses and in particular none in case of emergency; reduction of LOS; and the statistically dependent variables are as follows: LOS, mode of discharge and admission procedure. A smaller number of patients admitted to the ward demonstrate a more adequate destitution of access, thus reducing all non-urgent practices. A limitation of the study is the small number of samples in the dataset, due to the reduced observation period. In future studies more years of observation should be considered and also the variables considered should be extended. In addition, in a future development we could consider analyzing the effect of Covid-19 by comparing different departments of the same hospital and using different analysis techniques.

References

- [1] C. Wang, P.W. Horby, F.G. Hayden, G.F. Gao, A novel coronavirus outbreak of global health concern. *Lancet*, 395 (10223) (2020), pp. 470-473
- [2] Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob Agents*. 2020;55(3):105924. doi:10.1016/j.ijantimicag.2020.105924.
- [3] Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: a comparison with young and middle-aged patients. *J Inf Secur*. 2020;15(30):1-5 [Accessed April 18, 2020 [https://www.journalofinfection.com/article/S0163-4453\(20\)30116-X/pdf](https://www.journalofinfection.com/article/S0163-4453(20)30116-X/pdf)].
- [4] The Lancet. India under COVID-19 lockdown. *Lancet Lond Engl* 2020; 395:1315. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7180023/>. Accessed 24 August 2020.
- [5] Nguyen AX, Gervasio KA, Wu AY. Differences in SARS-CoV-2 recommendations from major ophthalmology societies worldwide. *BMJ Open Ophthalmology*. 2020 Jul 1;5(1):e000525.
- [6] Daoust JF. Elderly people and responses to COVID-19 in 27 Countries. *PLoS One*. 2020;15:e0235590.
- [7] Improta G, Simone T, Bracale M. HTA (Health Technology Assessment): a means to reach governance goals and to guide health politics on the topic of clinical Risk management. In *World Congress on Medical*

- Physics and Biomedical Engineering, September 7-12, 2009, Munich, Germany: Vol. 25/12 General Subjects 2009 (pp. 166-169). Springer Berlin Heidelberg.
- [8] Trunfio TA, Scala A, Borrelli A, Sparano M, Triassi M, Improta G. Application of the Lean Six Sigma approach to the study of the LOS of patients who undergo laparoscopic cholecystectomy at the San Giovanni di Dio and Ruggi d'Aragona University Hospital. In Proceedings of the 5th International Conference on Medical and Health Informatics 2021 May 14 (pp. 50-54).
 - [9] Improta G, Luciano MA, Vecchione D, Cesarelli G, Rossano L, Santalucia I, Triassi M. Management of the diabetic patient in the diagnostic care pathway. In 8th European Medical and Biological Engineering Conference: Proceedings of the EMBEC 2020, November 29–December 3, 2020 Portorož, Slovenia 2021 (pp. 784-792). Springer International Publishing.
 - [10] Improta G, et al. Health worker monitoring: Kalman-based software design for fault isolation in human breathing. In Proceedings of the European Modeling and Simulation Symposium (EMSS). 2014.
 - [11] Apicella A, Arpaia P, Frosolone M, Improta G, Moccaldi N, Pollastro A. EEG-based measurement system for monitoring student engagement in learning 4.0. *Scientific Reports*. 2022 Apr 7;12(1):5857.
 - [12] Ippariello L, D'addio G, Lanzillo B, Balbi P, Andreozzi E, Improta G, Faiella G, Cesarelli M. A novel approach to estimate the upper limb reaching movement in three-dimensional space. *Informatics in Medicine Unlocked*. 2019 Jan 1;15:100155.
 - [13] Rocco N, Nava MB, Catanuto G, Accurso A, Martorelli M, Oliviero O, Improta G, Papallo I, De Santis R, Gloria A, Speranza D. Additive manufacturing and tissue engineering to improve outcomes in breast reconstructive surgery. In 2019 II Workshop on Metrology for Industry 4.0 and IoT (MetroInd4. 0&IoT) 2019 Jun 4 (pp. 38-42). IEEE.
 - [14] Fucile P, Onofrio I, Papallo I, Gallicchio V, Rega A, D'Antò V, Improta G, De Santis R, Gloria A, Russo T. Strategies for the design of additively manufactured nanocomposite scaffolds for hard tissue regeneration. *Acta IMEKO*. 2020 Dec 17;9(4):53-9.
 - [15] Russo T, Peluso V, Gloria A, Oliviero O, Rinaldi L, Improta G, De Santis R, D'Antò V. Combination design of time-dependent magnetic field and magnetic nanocomposites to guide cell behavior. *Nanomaterials*. 2020 Mar 22;10(3):577.
 - [16] Fucile P, Papallo I, Improta G, De Santis R, Gloria A, Onofrio I, D'Antò V, Maietta S, Russo T. Reverse Engineering and Additive Manufacturing towards the design of 3D advanced scaffolds for hard tissue regeneration. In 2019 II Workshop on Metrology for Industry 4.0 and IoT (MetroInd4. 0&IoT) 2019 Jun 4 (pp. 33-37). Ieee.
 - [17] Scala A, Trunfio TA, Borrelli A, Ferrucci G, Triassi M, Improta G. Modelling the hospital length of stay for patients undergoing laparoscopic cholecystectomy through a multiple regression model. In Proceedings of the 5th International Conference on Medical and Health Informatics 2021 May 14 (pp. 68-72).
 - [18] D'Addio G, Donisi L, Pagano G, Improta G, Biancardi A, Cesarelli M. Agreement between opal and G-walk wearable inertial systems in gait analysis on normal and pathological subjects. In 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) 2019 Jul 23 (pp. 3286-3289). IEEE..
 - [19] Ponsiglione AM, Amato F, Cozzolino S, Russo G, Romano M, Improta G. A hybrid analytic hierarchy process and Likert scale approach for the quality assessment of medical education programs. *Mathematics*. 2022 Apr 24;10(9):1426.
 - [20] Scala A, Trunfio TA, De Coppi L, Rossi G, Borrelli A, Triassi M, Improta G. Regression models to study the total LOS related to valvuloplasty. *International journal of environmental research and public health*. 2022 Mar 7;19(5):3117.
 - [21] Di Laura D, D'Angiolella L, Mantovani L, Squassabia G, Clemente F, Santalucia I, Improta G, Triassi M. Efficiency measures of emergency departments: an Italian systematic literature review. *BMJ open quality*. 2021 Sep 1;10(3):e001058. doi: 10.1136/bmjopen-2020-001058.
 - [22] Scala A, Alfano R, Borrelli A, Rossi G, Triassi M. Logistic Regression to study the change in length of stay in a department of Ophthalmology in CoViD-19 era. In 2021 International Symposium on Biomedical Engineering and Computational Biology 2021 Aug 13 (pp. 1-4). <https://doi.org/10.1145/3502060.3503660>
 - [23] Montella E, Marino MR, Raiola E, Majolo M, Russo G, Rossi G, Borrelli A, Triassi M, Scala A. Covid-19: The Effect on Hospitalization Patient of Ophthalmology Department in "Antonio Cardarelli" Hospital. In *Biomedical and Computational Biology: Second International Symposium, BECB 2022, Virtual Event, August 13–15, 2022, Revised Selected Papers 2023 Feb 2* (pp. 489-495). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-25191-7_46.
 - [24] Ferraro A, Centobelli P, Cerchione R, Cicco MV, Montella E, Raiola E, Triassi M, Improta G. Implementation of lean practices to reduce healthcare associated infections. *International Journal of Healthcare Technology and Management*. 2020;18(1-2):51-72.