

Necessary Condition Analysis: Conditions for Surgical Length of Stay in Knee Replacement Study

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Background

- In this study, necessary condition analysis (NCA) was used to statistically analyze operative process data and length of stay (LOS) for patients undergoing joint replacement surgery.
- Establishing a necessary condition exists between operative processes and LOS would advance our understanding of surgical care processes.
- As an example, timely extubation after surgery is considered a best practice that reduces morbidity, mortality, and length of stay but there is not currently an optimal time specified. NCA could help.

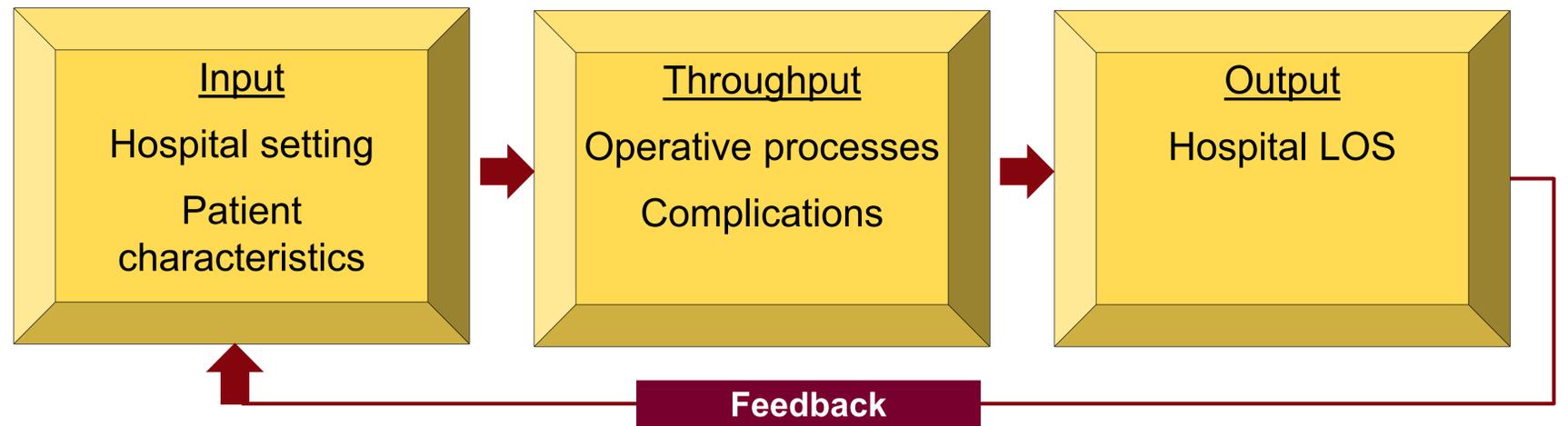
Purpose

- To determine if a necessary but not sufficient relationship exists between operative processes and patient length of stay in the post-operative knee replacement population.

Method

- This is a secondary data analysis using the Loyola Clinical Research Database to identify (n=485) knee replacement cases from June 2018 – June 2020.
- Patient characteristics and operative processes were analyzed using multiple regression analysis and NCA to determine if a relationship existed with LOS.
- Systems Theory was used to guide this research.

Systems Theory Model



Results

Sample (n=485)	% or M(SD)			
Male	37.9%			
Age (yr.)	66.2 (9.4)			
BMI	32.9 (6.4)			
White	71.5%			
Hispanic	10.5%			
Private Insurance	31.1%			
Any complication	1.4%			
Anesthesia time (min.)	172.0 (41.2)			
LOS (hr.)	77.7 (44.6)			
Regression Variables	Unstandardized B	Standardized B	t	p
Age	.550	.116	2.656	.008
BMI	.894	.126	2.834	.005
ASA	4.422	.092	2.133	.033
Anesthesia Time	.201	.183	4.499	<.001
Any Complication	132.161	.437	10.868	<.001
NCA Variables	Effect Size		p	
Anesthesia Time	.103		.001	
Any Complication	.027		.002	

- After regression analysis, age, BMI, ASA rating, time under anesthesia, and the presence of any complication* remained as significant predictors of LOS. These findings are similar to prior research.
* Sepsis, urinary tract infection, ileus
- After NCA, time under anesthesia and the presence of any complication remained as conditions necessary but not sufficient for a long LOS.

Implications for Research and Practice

- This is the first time that NCA has been used to evaluate operative processes in the hospitalized surgical care patient. These findings can inform future practice.
- NCA analyzes conditions to ascertain if they are necessary but not sufficient for an outcome to occur.

Conclusion

- More studies should look at evaluating necessary conditions in healthcare settings as a means to improve resource utilization and planning for patient care.