



Apply of Smart Intradialytic hypotension alert system to improve the quality of life of dialysis patients



P041

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Background

Intradialytic hypotension (IDH) is a serious complication during hemodialysis, linked to increased cardiovascular risk. Researchers have applied machine learning to develop effective prediction models for IDH. Our team achieved over 95% accuracy in previous studies. This study aims to develop an integrated alarm system, assess its impact on clinical outcomes and quality of life, and evaluate nursing staff satisfaction before and after implementation in a hemodialysis unit.

Method

Since August 2021, we developed and integrated an alarm system into the medical process, implementing it in October 2021 for patients receiving hemodialysis. Data from their dialysis sessions were collected from November 2021 to May 2022, with a control period from June 2020 to October 2021. Nursing staff received training on system operation and intradialytic hypotension management before implementation. Pre- and post-study Quality of Life questionnaires were administered to patients and analyzed using paired t-tests ($p < 0.05$). We compared the incidence of intradialytic hypotension events and the nadir of systolic blood pressure during the study and control periods using a generalized estimate equation ($p < 0.01$).

Result

A total of 73 patients completed the study. Analysis of the penalized data showed that the rate of intradialytic hypotension events was higher in the study period compared to the control period (odds ratio 1.472, $p = 0.007$). The nadir of intradialytic systolic blood pressure during the study period was also significantly lower than during the control period (coefficient -2.241, $p < 0.001$) The Quality of Life questionnaire revealed significant improvements in four domains before and after implementation: overall quality of dialysis (4.01 ± 0.13 to 4.34 ± 0.08), intradialytic hypotension (2.96 ± 0.05 to 3.42 ± 0.09), dialysis-related symptoms (3.08 ± 0.12 to 3.57 ± 0.09), and leisure and sports activities (3.16 ± 0.06 to 3.50 ± 0.09). Mental health did not show a significant improvement ($p = 0.11$).

Table 1 Statistics Result

QoL questionnaires	Before	After	P value
Dialysis Overall	4.01± 0.13	4.34±0.08	0.03 *
Mental health satisfaction	2.95 ± 0.15	3.24 ±0.13	0.11
intradialytic hypotension satisfaction	2.96± 0.05	3.42± 0.09	< 0.01 *
dialysis-related symptoms Satisfaction	3.08 ± 0.12	3.57± 0.09	<0.01 *
life and activities Satisfaction	3.16 ± 0.06	3.50 ± 0.09	<0.01 *

Figure 2 Questionnaires

構面	Qx	Title
透析滿意度	Q10	我對於洗腎過程感到滿意
	Q11	我對於洗腎時護理的照顧感到滿意
	Q12	我對於洗腎時醫師的照顧感到滿意
	Q13	我對於洗腎時與護理人員的互動感到滿意
	Q1	我覺得洗腎過程中安全
透析心理壓力	透析低血壓	
	Q7	我擔心洗腎過程可能其他症狀
	Q5	我覺得低血壓警示系統會讓我感到安心
	Q6	我擔心洗腎過程可能低血壓情形發生
	Q4	我覺得低血壓警示系統感到期待
	透析相關症狀	
	Q8	我覺得在洗腎時對我而言是不舒服的
	Q18	透析當天我會感覺頭暈
	Q17	平常日子，我無法完成中度體力的佳士活動(如拖地、搬桌椅)
	Q19	平常日子，活動我會很喘
	Q16	平常日子，我的皮膚會很癢
	Q15	血液透析後，當天我會感到心臟不舒服
	Q14	血液透析後，當天我會感到身體很累想要休息
	運動與生活	
	Q2	我覺得洗腎過程中緊張
	Q25	平常日子，我有規律的運動(如打太極拳、散步爬山等)
	Q26	平常日子，我很少有休閒活動(如聽音樂、打牌、看電視、玩手機等)
	Q3	我覺得洗腎過程中放鬆
	Q20	我覺得我的血液透析康管很醜且怕別人看到

Conclusion

In our study, the incidence of intradialytic hypotension did not decrease after implementing the clinical alert system. This may have been related to the COVID-19 pandemic and the disease progression of the patients. However, the quality of life of dialysis patients showed a significant improvement after the implementation of the system. This study suggested the implementation of IDH alarm systems in dialysis units may improve the quality of life of patients, but further research is needed to confirm these findings.

Figure 3 The process of AI-assisted Alarm system

