PHILIPS

Patient monitoring

Biosensor BX100

Deployment of a wearable biosensor system in the emergency department: a technical feasibility study

Wearable biosensors, such as the Philips Biosensor BX100 can be used in hospital settings to provide unobtrusive, important insights into health conditions (1). These devices can improve a hospital's capacity to monitor patients in non-traditional settings, provide safer quality care, and improve the patient hospital experience (2).

Figure 1: Philips Wearable Biosensor BX100

Methods

Philips General and Specialty Care, in conjunction with an urban, academic, quaternary care center in the metropolitan Boston area, conducted an IRB approved technical feasibility study to investigate the challenges and considerations of deploying and using the BX100 in a hospital environment. The study was conducted in the hospital's emergency department observation unit (EDOU), which is designed to function like a short-stay hospital unit and manages patients who have projected hospital stay of up to 48 hours.

44 patients were enrolled in the study. 56.8% of patients were male and 43.2% of patients were female. The mean age was 54.0 years (range 21-84 years) and the mean BMI 27.5 kg/m2 (range 20.2 – 61.6 kg/m2)

Results

Patients were asked to rate their experience with the biosensor, and overall 93.2% of patients reported they experienced no discomfort and 90.9% of patients said they would wear the device again.

Table 1: Patient Experience Questionnaire

Experienced discomfort during placement of device	None: 100% (n=44)
Experienced discomfort while wearing device	None: 93.2% (n=41) Minimal: 2.3% (n=1) Missing data: 4.5% (n=2)
Experienced discomfort during device removal	None: 59.1% (n=26) Minimal: 27.3% (n=12) Mild: 2.3% (n=1) Moderate: 4.5% (n=2) Severe: 2.3% (n=1) Missing data: 4.5% (n=2)
Inconvenienced while wearing device	None: 93.2% (n=41) Mild: 2.3% (n=1) Missing data: 4.5% (n=2)
Would wear the device again	Yes: 90.9% (n=40) No: 4.5% (n=2) Missing data: 4.5% (n=2)

Technical Feasibility Data[2]

The biosensors were successfully placed and connected on the first try in 93.2% (n=41) of cases. In 5.9% (n=3) of instances the initial biosensor did not successfully connect to the installed network, and the biosensor was replaced with a new device. In each of these cases the subsequent sensor paired successfully.

Across all biosensors used in the study, 0.1% (SD=0.2) of calculated observations were not uploaded to the server due to network latency.

Signal Quality Index[3]

The physiological values collected by the BX100 (heart rate, respiratory rate) have an associated signal quality index that indicates whether the observation is valid or invalid. This is used to prevent low quality data from being reported to the backend system.

For the observations collected in this study, 88.9% of heart rate values and 86.0% of respiratory rate values were found to be valid across the monitoring period.

Table 2: Percentage of Observations with Valid vs Invalid SQI

Total devices N=51	Mean (SD)[a]	Percentage[b]
Observations with Invalid HR SQI	20.7 (34.7)	11.1
Observations with Valid HR SQI	79.2 (34.9)	88.9
Observations with Invalid RR SQI	26.8 (38.4)	14.0
Observations with Valid RR SQI	73.1 (38.6)	86.0

[a] average percent within devices

[b] percent over monitoring time across devices

Conclusions

Overall, this study demonstrated that a wireless, wearable biosensor system is a feasible technology to deploy in the emergency departments. The data was collected successfully and reliably. The results of this clinical investigation suggest that the deployment of the wearable biosensors may alter the method in which emergency departments triage and deliver care to patients that traditionally needed a wired monitor[1].

References:

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2. Miller KM, Hasdianda AM, Jambaulikar GD, Baugh CW, Divatia S, Boyer EW, Chai PR. Deployment of a wearable biosensor system in the emergency department: a technical feasibility study. Proceedings of the Hawaii International Conference on System Sciences-53. Jan 2021. Accepted.
3. Divatia, S, Langhorn, C, Wang, J., (2020). Clinical Study Report - G10 Biosensor Monitoring in an Emergency Department Observation Unity [Clinical Study Report]. Philips Healthcare. Confidential company data.

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