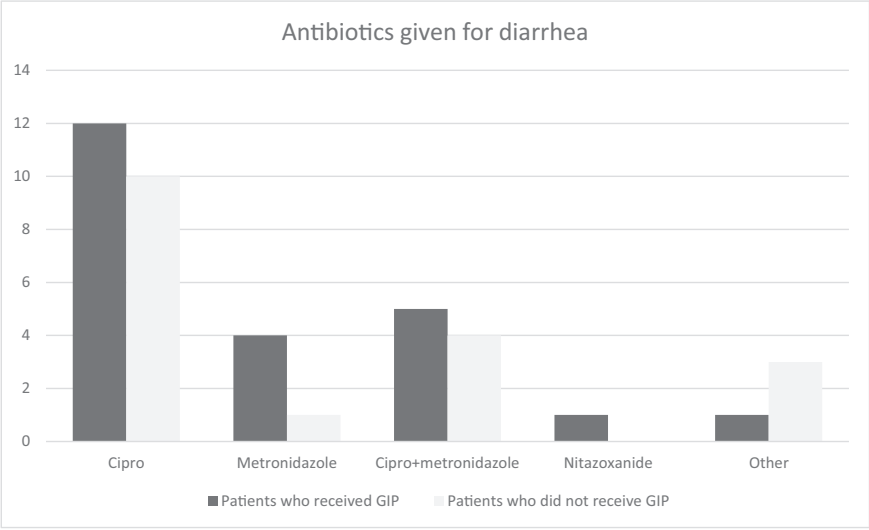

Fig. 2. Antibiotics given for diarrhea.

linked to an increased incidence of antibiotic resistance as well as rates of hemolytic-uremic syndrome (HUS) [4,5,7]. Of the patients who tested positive for only a virus, none were given antibiotics for diarrhea, highlighting the utility of the GI PCR test in identifying patients with viral etiologies to avoid empiric antibiotic use. Potential disadvantages of GI PCR in the ED include increased costs, greater detection of asymptomatic colonization [8], and increased ED length of stay. Others disadvantage of GI PCR is that it lacks the ability to test for antibiotic resistance, perform genome sequencing or perform serotyping [9]. The most significant limitation of this study is that the difference in antibiotic prescribing rates may have been due to differences in clinical severity and not due to results of the GI PCR.

Author contributions

ACM, AL, ST contributed to study concept and design, acquisition of the data.

ACM, YM, HW, AL, ST contributed to analysis and interpretation of the data.

YM and HW contributed statistical expertise.

AL, ACM, HW, ML, ST, YM contributed to drafting and critical revision of the manuscript.

ACM takes responsibility for the paper as a whole.

Andrew C. Meltzer*
Annabel Li
Sarah Tran
Maxine LeSaux
The George Washington University, School of Medicine & Health Sciences, United States of America
*Corresponding author.
E-mail address: ameltzer@mfa.gwu.edu.

Haijun Wang
Yan Ma
George Washington University, Milken School of Public Health, Department of Biostatistics and Epidemiology, United States of America

3 December 2018

https://doi.org/10.1016/j.ajem.2018.12.019

References

[1] Agency for Healthcare Research and Quality (AHRQ). HCUPnet, healthcare cost and utilization project. Rockville, MD. https://hcupnet.ahrq.gov/.
[2] Riddle MS, Herbert D, Connor B. Diagnosis, treatment, and prevention of acute diarrheal infections in adults. Am J Gastroenterol 2016;11:602–22.
[3] Shane AL, Mody RK, Crump JA, et al. 2017 Infectious Diseases Society of America clinical practice guidelines for the diagnosis and management of infectious diarrhea. Clin Infect Dis 2017;65(12):e45–80.
[4] Wong CS, Mooney JC, Brandt JR, et al. Risk factors for the hemolytic uremic syndrome in children infected with *Escherichia coli* O157:H7: a multivariable analysis. Clin Infect Dis 2012;55(1):33–41.
[5] Luangtongkum T, Jeon B, Han J, et al. Antibiotic resistance in campylobacter: emergence, transmission and persistence. Future Microbiol 2009;4(2):189–200.
[6] Kaji AH, Schriger D, Green S. Looking through the retrospectoscope: reducing bias in emergency medicine chart review studies. Ann Emerg Med 2014;64:292–8.
[7] Huang JY, Henao OL, Griffin PM, et al. Infection with pathogens transmitted commonly through food and the effect of increasing use of culture-independent diagnostic tests on surveillance – Foodborne Diseases Active Surveillance Network, 10 U.S. sites, 2012–2015. MMWR 2015;64(9):368–71.
[8] Freeman K, Mistry H, Tsertsvadze A, et al. Multiplex tests to identify gastrointestinal bacteria, viruses and parasites in people with suspected infectious gastroenteritis: a systematic review and economic analysis. Health Technol Assess 2017;21(23).
[9] Iwamoto M, Huang JY, Cronquist AB, et al. Bacterial enteric infections detected by culture-independent diagnostic tests – FoodNet, United States, 2012–2014. MMWR 2015;64(9):252–7.

Early diagnosis of acute respiratory failure using an E-health application in patients requiring oxygen therapy

Dear editor-in-chief

Patients without life-threatening conditions, who require a treatment at the hospital, are admitted to a medical unit without continuous monitoring. Monitoring of patients by the nurse is performed manually with a maximum frequency of three or four times per day. In addition to this monitoring, these patients could be real-time monitored, using Sensium® E-health technology [1]. This wearable and wireless Patch measures heart rate (HR), respiration rate (RR) and axillary temperature, and provides updated data every 2 min. The Emergency physician is notified by E-mail and I-phone® (Apple) application of abnormal

changes in patients' vital signs suggestive of patient deterioration (Fig. 1). The present case describes how the application E-health technology allows early diagnosis of acute respiratory failure.

A thirty-six years old homeless patient presented a hyperthermia at 38.4 °C. HR was 110 bpm, RR was 22 min^{-1}, and pulse oximetry indicated an oxygen saturation level between 93 and 95% SpO_2. Following physical examination and thoracic radiography, we established the diagnosis of right lower lobe pneumonia. Laboratory tests showed white blood cell count of 14.7 · 10^9 L^{-1} (N: 4–10.10^9) and procalcitonin was 0.39 μg·L^{-1} indicating a bacterial infection [4]. A treatment with systemic amoxicillin 1000 mg was started, three times per day for seven days. After initiation of oxygen therapy (2 L·min^{-1}), RR was 18 min^{-1} and SpO_2 was 99%. We monitored in real time the patient in our medical unit, using Sensium® technology and the nurse had to check vital signs manually every 8 h. Three hours after he was admitted, emergency physician received an alert by E-mail on the 29 August 2018 at 13:26 pm indicating a sudden increase of RR from 22 min^{-1} to 51 min^{-1}, HR from 75 to 157 bpm, and temperature from 38.0 to 39.5 °C at 13:32 (Fig. 2). Clinical examination found a severe acute respiratory failure with severe sepsis. He had an increase in bronchial congestion. He was immediately admitted in critical care unit. Because of early care due to the alarm signal, the patient quickly received reinforcement in oxygenation therapy without requiring mechanical ventilation and the treatment for the sepsis resulting from pneumonia. His medical condition improved within only three days before going back to medicine unit. The patient was discharged from the hospital after seven days.

Breathing is controlled by the respiratory centers, located with other vital centers in the medulla, which is part of the brain stem [2]. The respiratory system is designed to maintain homeostasis with respect to gas exchange and acid-base status. Derangements in oxygenation as well as acidosis can lead to dyspnea. The medulla oblongata contains the dorsal respiratory group responsible for the inhalation, the ventral respiratory group responsible for the exhalation and the pneumotaxic center which ensures the modification of inspiratory time and finally, the RR increase [3].

Ventilation is measured as ventilation minutes (Vm), i.e. total amount of mobilized air by the lung in a minute. Vm (L·min^{-1}) is calculated as RR (min^{-1}) × tidal volume (Vt in L) [4]. The normal RR is approximately 12 min^{-1} [5]. The Vt is 6–8 mL·kg^{-1} [5], or on average 500 mL [6]. The RR increases in order to maintain constant Vm, in case of ventilatory disorder generating a decrease of the Vt. During acute respiratory failure, RR is higher than 25 min^{-1} [7]. Then, consequently RR can get beyond 30 to 40 min^{-1} due to the reinforcement of the pneumotaxic center command. On the contrary, in case of a decreased pneumotaxic command (e.g. in case of a toxic coma), RR can be reduced to 5 min^{-1} [2]. One of the early clinical sign of a respiratory failure is the RR increase. By increasing the ventilation, the exhalation also becomes active so that the abdominal muscles become active. Will appear the others clinical signs of the work of breathing [8]. Cyanosis and desaturation are warning clinical signs of respiratory decompensation [7].

Usually, patients hospitalized for community-acquired pneumonia requiring oxygen therapy but without vital distress, are not monitored in an intensive or critical care unit after their visit to ED. This situation can be life-threatening, especially if patients are unable to call for help like this confused patient, until the nurse arrives for scheduled surveillance. The present case demonstrated how E-health technology using the Sensium® device might be helpful to early diagnose these clinical deteriorations by alerting doctors and nurses of early signs of acute respiratory failure and sepsis which are RR and HR. Continuous vital signs monitoring outside the critical care setting is feasible and may provide a benefit in terms of improved patient outcomes and cost efficiency [9]. Future large, well-controlled randomized studies in high-risk populations requiring oxygen would evaluate the clinical benefit of this E-health technology for continuous monitoring systems. It might be able not only to

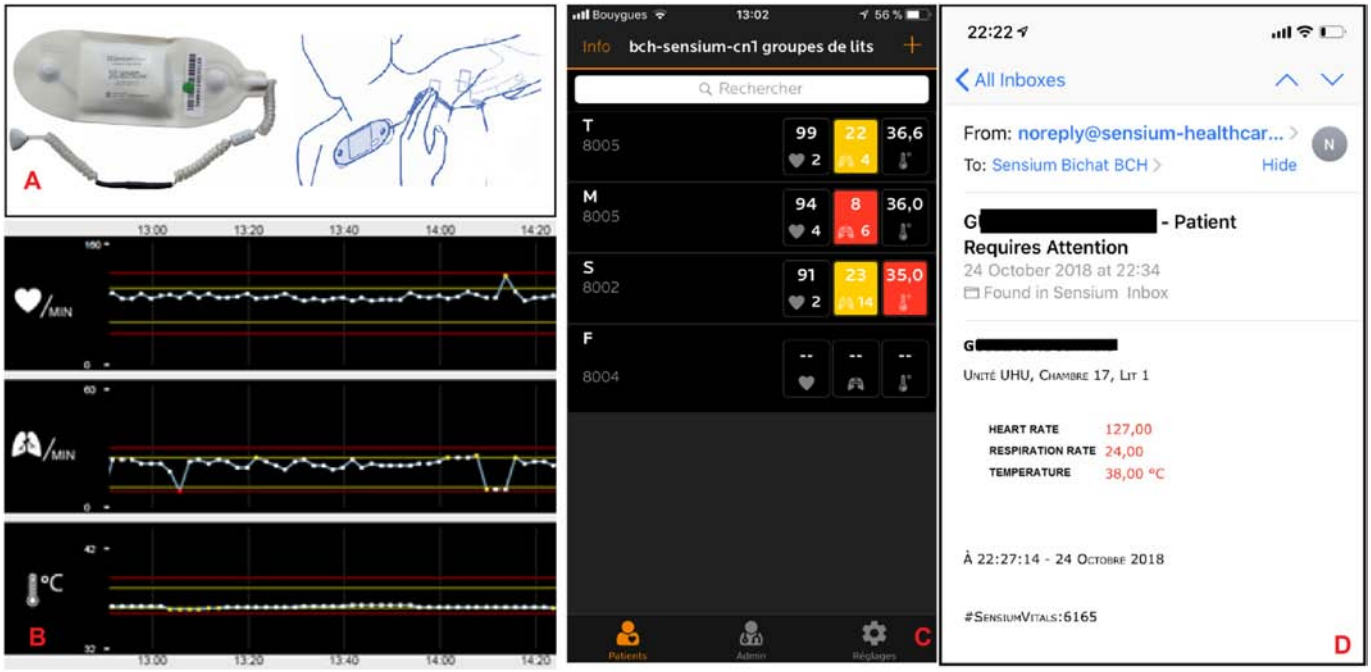

Fig. 1. Sensium® system for continuous monitoring outside of high acuity areas. Legend: A: wireless monitoring system; B: Software with analysis of heart rate, respiration rate, and temperature; C: I-Phone® application; D: E-mail with alert notification.

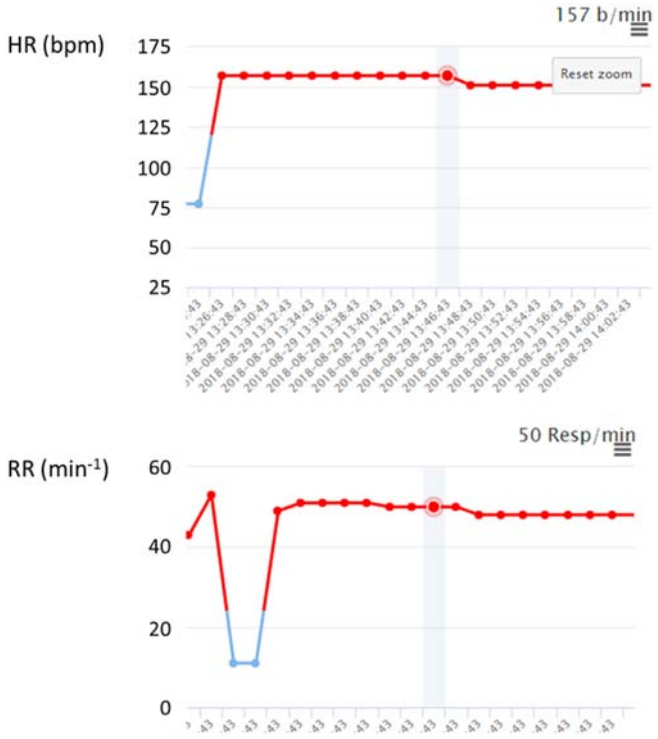

Fig. 2. Early diagnosis of acute respiratory failure using Sensium® technology. Legend: HR: heart rate; RR: respiration rate.

detect clinical degradation but also could be incorporated in a predictive clinical strategy to prevent fatal outcome in some patients monitored outside an intensive unit.

List of abbreviations

HR	heart rate
RR	respiration rate
Vm	ventilation minutes
Vt	tidial volume

Availability of data and material

All data analyzed during this study are included in this case presentation. For more details, please contact the corresponding author.

Consent for publication

The corresponding author declare that the patient consent for publication of individual clinical details. The manuscript does not contain individual image or video.

Funding

The authors declare that they have no source of funding for the research.

Competing of interest

The authors declare that they have no competing interests.

Daniel Aiham Ghazali
Emergency Department, University Hospital of Bichat, AP-HP, Paris, France
Ilumens - Simulation laboratory, University of Paris-Diderot, Paris, France
Corresponding author at: Emergency Department and Emergency Medical Service, University Hospital of Bichat, 46 rue Huchard, 75018 Paris, France.
E-mail address: danielaiham.ghazali@aphp.fr.

Olivia Stephan
Christophe Choquet
Stéphanie Antoniol
Emergency Department, University Hospital of Bichat, AP-HP, Paris, France

Enrique Casalino
Emergency Department, University Hospital of Bichat, AP-HP, Paris, France
Clinical Investigation Center - EA 7335 REMES, University Paris-Diderot, Paris, France

10 December 2018
https://doi.org/10.1016/j.ajem.2018.12.020

References

[1] Ghazali AD, Choquet C, Casalino E. Early diagnosis of atrial fibrillation using an E-health application. Am J Emerg Med 2018;S0735–6757(18):30543–6. https://doi.org/10.1016/j.ajem.2018.06.061.
[2] Guyton AC, Hall JE. Textbook of medical physiology. 13th ed. Philadelphia: W.B. Saunders Company; 2015; 502.
[3] Cohen MI. Central determinants of respiratory rhythm. Annu Rev Physiol 1981;43:91–104.
[4] Zweiker D, Schwaberger H, Urlesberger B, Mileder LP, Baik-Schneditz N, Pichler G, et al. Does the number of fingers on the bag influence volume delivery? A randomized model study of bag-valve-mask ventilation in infants. Children (Basel) 2018;5(10):132. https://doi.org/10.3390/children5100132.
[5] Guyton AC, Hall JE. Textbook of medical physiology13th ed. Philadelphia: W.B. Saunders Company; 2015; 467.
[6] Mora Carpio AL, Mora JI. Ventilator management. StatPearls Publishing LLC; 201828846232.
[7] McEvoy M. Strugging to breathe. Decision making in the assessment & treatment of acute respiratory distress. JEMS 2013;38(8):50–6.
[8] Ahmed A, Graber MA. Evaluation of the adult with dyspnea in the emergency department. UpToDate. https://www.uptodate.com/contents/evaluation-of-the-adult-with-dyspnea-in-the-emergency-department#H13; 2013, Accessed date: 10 December 2018.
[9] Downey CL, Chapman S, Randell R, Brown JM, Jayne DG. The impact of continuous versus intermittent vital signs monitoring in hospitals: a systematic review and narrative synthesis. Int J Nurs Stud 2018;84:19–27. https://doi.org/10.1016/j.ijnurstu.2018.04.013.

Faculty opinions concerning ultrasound utilization in the emergency department

As point-of-care ultrasound (POCUS) is becoming increasingly pervasive in the emergency department (ED), ultrasound is being incorporated into medical education targeting every stage of training: medical school, residency, and fellowship [1-4]. Previously under-developed, ultrasound education targeting academic emergency medicine faculty (AEMF) is a growing area of interest as hospitals, administrators, and emergency medicine leadership are facing hospital specific ultrasound privileging and credentialing questions [5,6].

Despite the growing interest in the ultrasound competency of AEMF, advanced training and availability of ultrasound technology, the number of faculty who use POCUS and the frequency of its use does not match the growth in training and availability of the devices [4,7,8]. The purpose of this study was to determine the perceived barriers to POCUS utilization experienced by AEMF at an academic