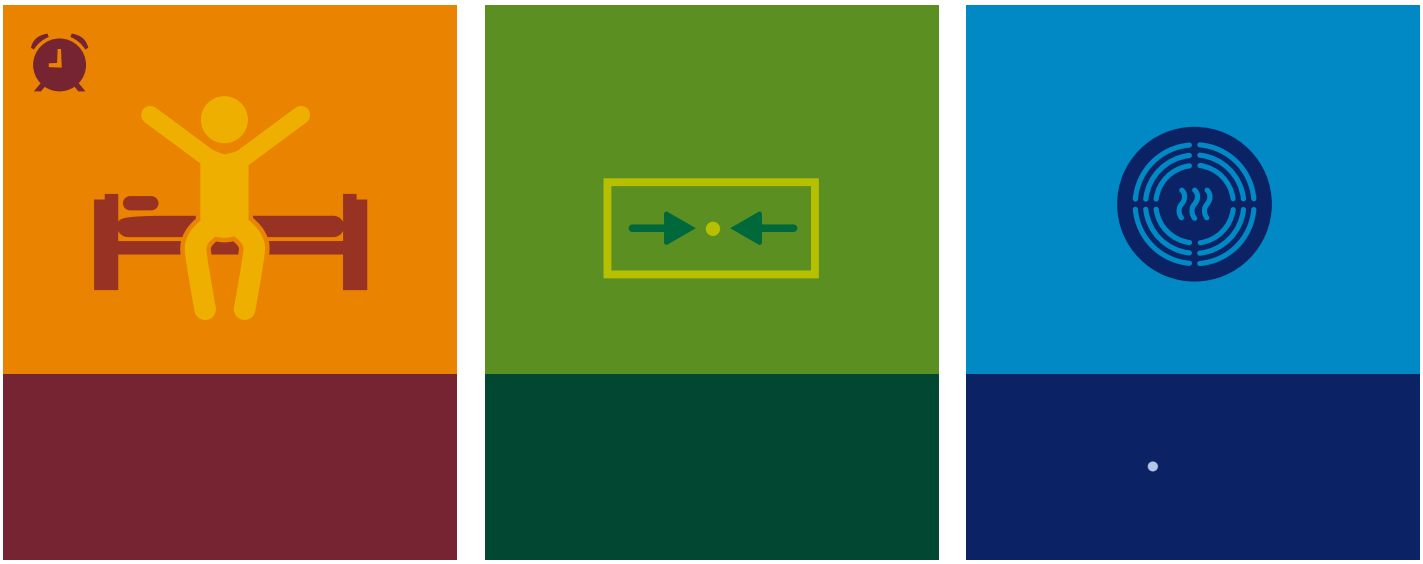


Table of content

What is alarm fatigue?

Alarm fatigue is a problem that can be found around the world where devices or processes are controlled by humans.

Here are some generic and clinical alarm fatigue cases and research, surveys, and ndings on the topic of alarm fatigue.

Click a topic to get started.

Note: This is the homepage. You can access any topic and return to this page by clicking the Home icon .

Alternatively, you can click through the next arrow to view all of these topics in a sequence.

Generic alarm fatigue cases

Overview

Alarm fatigue is a problem that can be found around the world where devices or processes are controlled by humans. Obviously, in industries like transportation or the oil rigging industry, alarm fatigue can have disastrous consequences.

Take a look at the examples on the next pages!

Generic alarm fatigue cases

Disastrous mishaps

Click an icon to learn more.

Generic alarm fatigue cases

Disastrous mishaps

Click an icon to learn more.

What happened?

The BP Deepwater Horizon rig exploded in 2010, killing 15 workers and injuring 180. Millions of gallons of oil spewed into the Gulf of Mexico following the blast.

How did it occur?

The alarm did not sound during the emergency, leaving workers to relay information through the loudspeaker system.

Why did it happen?

The general safety alarm was habitually set to “inhibited” to avoid waking up the crew with late-night sirens and emergency lights. The rig’s chief electronic technician, Mr. Williams, informed the federal panel of investigators that people did not want to be woken up at 3:00 a.m. from false alarms.

Generic alarm fatigue cases

Disastrous mishaps

Click an icon to learn more.

What happened?

Korean Airlines ight 801 crashed at Sasa Valley on Aug 6, 1997; 228 of the 254 aboard the Boeing 747 were killed.

How did it occur?

The “minimum safe altitude warning” alarm did not sound as it should have.

Why did it happen?

The controllers thought the “minimum safe altitude warning” alarm system in the control tower had sounded too often, so they persuaded a technician to prevent it from sounding under normal circumstances.

Generic alarm fatigue cases

Disastrous mishaps

Click an icon to learn more.

What happened?

A fatal rail crash was reported in London.

How did it occur?

The train driver repeatedly “acknowledged” an alarm from an Automated Warning System (AWS), signaling a Signal Passed At Danger (SPAD) event.

Why did it happen?

O cial investigations mention that the driver’s action of depressing the acknowledge button had become a “conditioned response”, a phenomenon that was not uncommon among conductors. Even though there were three “lines of defense, the signal, the AWS warning that a signal at danger had been passed, and the safety director’s repeated clear written warnings about SPAD incidents in this area, 31 were killed and many injured.

Source:

Whittingham, R.B., 2004. The blame machine: why human error causes accidents. Burlington, MA: Elsevier.

The Guardian, 2000, https://www.theguardian.com/uk

Clinical alarm fatigue cases

Overview

As in the non-clinical examples, in a clinical setting, alarm fatigue can appear in varying shapes and forms. People may turn o alarms, not believe that the alarm is a true one, or simply not react to it.

View the next two pages on ICU and perioperative case vignettes.

Clinical alarm fatigue cases

ICU case vignettes

Here are three further ICU cases that underline the issue of mishaps owing to alarm fatigue:

Click the icons to learn more about each case.

Clinical alarm fatigue cases

ICU case vignettes

Here are three further ICU cases that underline the issue of mishaps owing to alarm fatigue:

Click the icons to learn more about each case.

What happened?

A patient died after the unit's monitoring alarms were shut o .

How did it occur?

A registered nurse in the hospital's telemetry unit turned o an array of alarms that were hooked up to all of the patients in that unit. During that time, one of the patient's blood-oxygen level dropped slowly from a normal level in the 90s to the 30s—a dangerously low level—for 45 minutes. The patient was found unresponsive, ashen, pale, and cyanotic. After checking for pulse, RNs were called out and Code Blue was called.

Why did it happen?

All of the alarms in the unit had been shut o for roughly three hours. As a result, when the patient's blood oxygen level dropped, no alarm sounded to alert the nurses of the danger. When asked why the alarms were shut o , the nurse responded, "the alarms were always going o , even if the patients weren't in distress."

Source:
https://www.usatoday.com/

Clinical alarm fatigue cases

ICU case vignettes

Here are three further ICU cases that underline the issue of mishaps owing to alarm fatigue:

Click the icons to learn more about each case.

What happened?

A 60-year-old man died in an intensive care unit of a medical center.

How did it occur?

Alarms signaling the patient's fast heart rate and potential breathing problems went unanswered for nearly an hour.

Why did it happen?

Nurses exposed to a cacophony of beeps became conditioned to ignore them after some time. That's what appears to have happened in this case. The investigation report mentions that the responsible nurse assumed that somebody else had taken care of the "warning" alarm. Only after a "critical" alarm sounded 45 minutes later, the nurse reacted and found the patient in a fatal condition.

Source:
http://archive.boston.com

Clinical alarm fatigue cases

ICU case vignettes

Here are three further ICU cases that underline the issue of mishaps owing to alarm fatigue:

Click the icons to learn more about each case.

What happened?

Philips received a complaint involving a fatal event. The customer maintained that a cardiac arrest had not been signaled by the monitor.

How did it occur?

Analysis of the alarm logs revealed that there had been 11 alarms, all of which were acknowledged by the sta . These alarms were acknowledged without walking over to the patient; hence, the patient's condition went unnoticed.

Why did it happen?

This fatal event appears to be very analogous to the rail crash example. Acknowledging false alarms can become a mechanical process, so that nurses no longer check whether an alarm is in fact a false alarm.

Source:
Philips internal analysis of a monitor log after a customer complaint involving a fatal event

Clinical alarm fatigue cases

Perioperative case vignettes

Here are a few demonstrative perioperative cases that underline the issue of mishaps owing to alarm fatigue.

Click each icon to learn more about the cases.

Clinical alarm fatigue cases

Perioperative case vignettes

Here are a few demonstrative perioperative cases that underline the issue of mishaps owing to alarm fatigue.

Click each icon to learn more about the cases.

What happened?

A patient led a lawsuit blaming the distracted doctor, failure of all alarms, and the carelessness of the anesthesiologist.

How did it occur?

On September 25, 2014, a woman underwent an operation for removal of a ganglion cyst in her wrist in the OR of an Ambulatory Surgery Center. After some time, the circulating nurse noticed that the patient's face had turned "dusky blue." No alarm on the blood pressure monitor, pulse oximeter, and ECG sounded when the tourniquet de ated and released a dangerous bolus dose of lidocaine into the patient's system, causing arrhythmia and downward spiral. She was resuscitated with mask ventilation, epinephrine, and chest compressions. Initially, unable to breathe on her own, she was intubated and transferred to another hospital.

Why did it happen?

The anesthesiologist, though present at the patient side, was looking in a di erent direction at an electronic device in his hand. Besides, all alarms were turned o .

Source:
http://www.outpatientsurgery.net/

Clinical alarm fatigue cases

Perioperative case vignettes

Here are a few demonstrative perioperative cases that underline the issue of mishaps owing to alarm fatigue.

Click each icon to learn more about the cases.

What happened?

A patient died during an elective surgical procedure in a German hospital.

How did it occur?

On January 11, 2011, a woman underwent a breast enlargement operation. Early on in the procedure, the patient su ered severely low blood oxygen levels. But the alarm that would warn about such an event had been turned o by the anesthesiologist. Thus the dangerous condition went unnoticed and led to a cardiac arrest. Despite resuscitation, the patient died a few days later while in coma.

Why did it happen?

The investigation revealed several factors contributing to the fatal event. The anesthesiologist stated that she was completely desensitized to the regular sounds of the monitor indicating the heartbeat. Who actually had turned o the alarm on the oxygen saturation remained unclear.

Source:
http://www.sueddeutsche.de
http://www.faz.net

Clinical alarm fatigue cases

Perioperative case vignettes

Here are a few demonstrative perioperative cases that underline the issue of mishaps owing to alarm fatigue.

Click each icon to learn more about the cases.

Case 1 – Weaver JM: Alarm Fatigue Can Decrease the Safety of Dental O ce Sedation and Anesthesia. Anesthesia Progress 2013, 60(3): 93–94

During dental surgery, the dentist noticed an alarm indicating sudden decrease in blood oxygen saturation. He had the oximeter probe replaced to other ngers of the same and then of the opposite hand but the pulse oximeter still showed abnormal reading. He then ordered for another pulse oximeter that too appeared to be faulty. Meanwhile, the patient su ered a hypoxia-induced cardiac arrest.

Source:
https://www.ncbi.nlm.nih.go

Case 2 – AHCmedia.com

A 17-year-old high school junior underwent a tonsillectomy at a Pennsylvania surgery center. In the recovery room she was given a potent painkiller that slowed her breathing. She was left unobserved for 25 minutes. The monitors in the recovery room, which would have alarmed on the condition, were all set to mute. By the time nurses checked on her, she had su ered profound and irreversible brain injury. She died 15 days later.

Her parents won a lawsuit of $6 million malpractice settlement.

Source:
https://www.ahcmedia.com

Research, surveys, and ndings

Overview

Seeing as alarm fatigue is both dangerous and widely underestimated, we dug deeper into the topic.

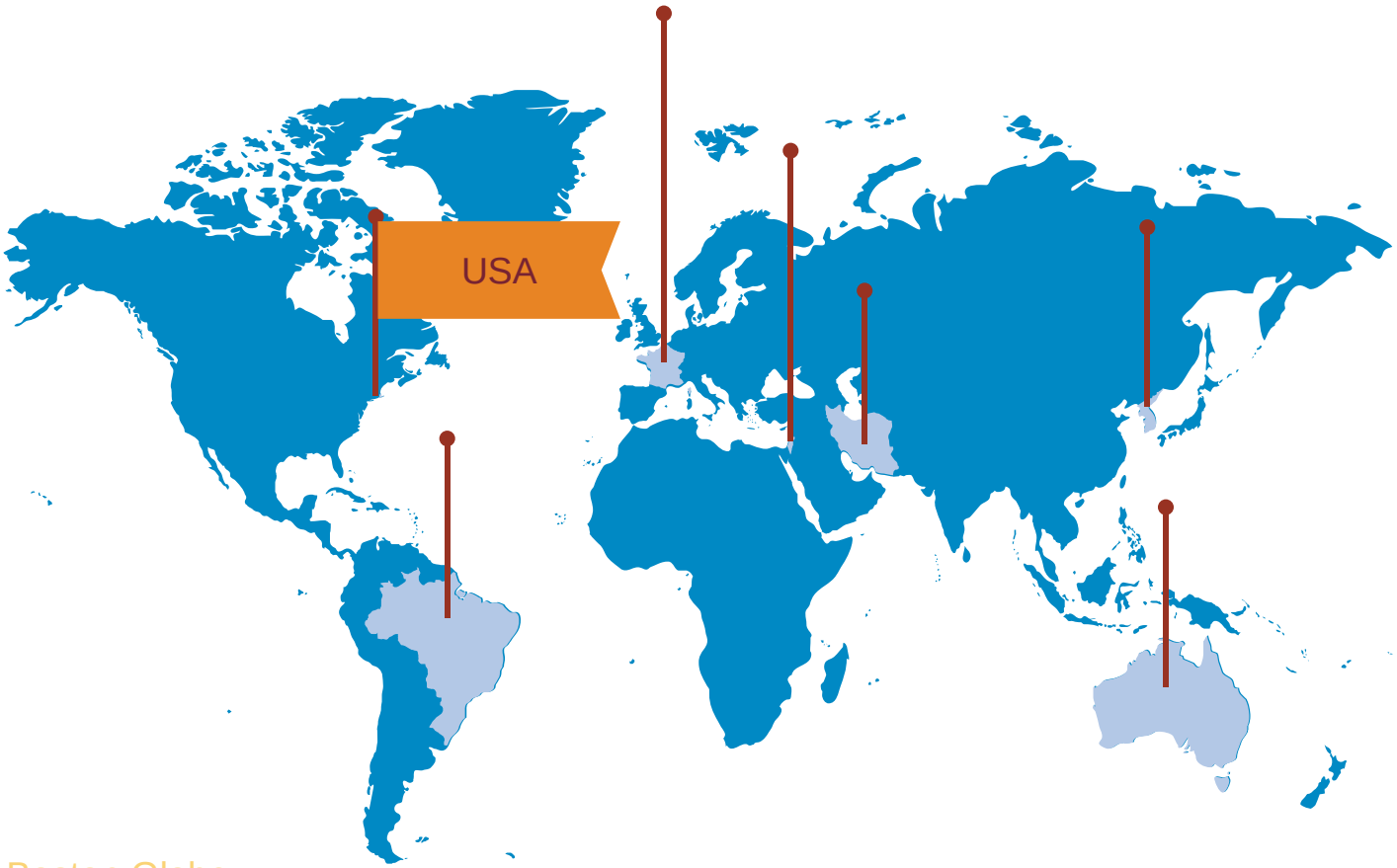
View the next pages to read through some findings related to alarm fatigue and its causes.

Research, surveys, and ndings

Alarm fatigue threat around the world

Now that you've read about a few individual alarm fatigue cases, let's review some consolidated reports of alarm fatigue from around the globe.

Click each highlighted country to learn more.



Boston Globe

The Joint Commission warned hospitals that constant beeping of medical devices on patients desensitizes caregivers and causes them to ignore or disable the alarm systems, thus causing critical danger to the life of patients. It also stated that between 2009 and 2012, 80 cases of deaths and 13 cases of severe injuries due to alarm fatigue were reported. As there are no means to track cases of alarm fatigue, authorities depend on hospitals that report such cases voluntarily. It can be safely assumed that the actual number of deaths caused due to alarm fatigue is much higher.

Source:
https://www.bostonglobe.com

Research, surveys, and ndings

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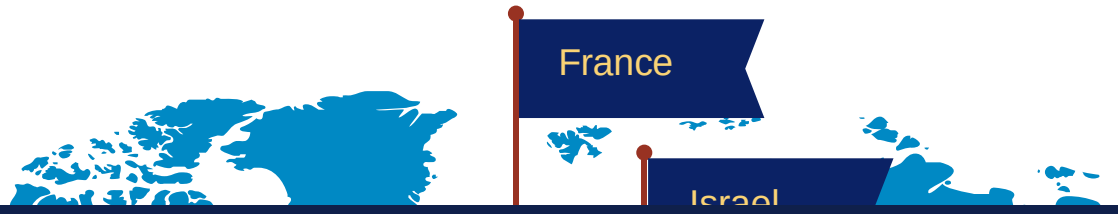

Israel

A study was conducted in Israel to observe and analyze the reactions of nurses toward monitor alarms in NICU. It was observed that nurses do not react directly to alarms, rather they use them as a source of information to be recorded in daily routine activities.

Title: Bitan, Y., Meyer, J., Shinar, D., & Zmora, E. (2004). Nurses' reactions to alarms in a neonatal intensive care unit. Cognition, Technology & Work, 6(4), 239-246.

Source:
https://link.springer.com

Boston Globe

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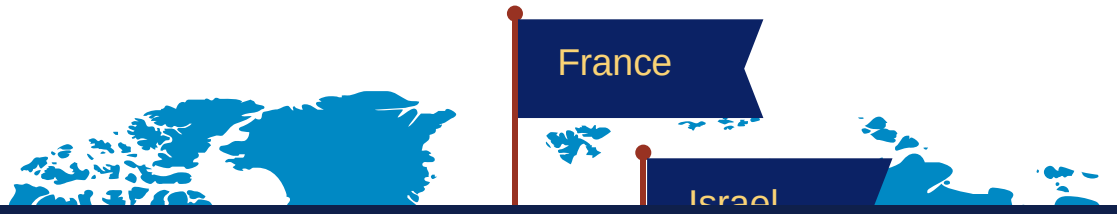

Brazil

A study was conducted in Brazil to observe and analyze the reactions of a healthcare team toward monitoring alarms in ICU. It was observed that the reaction time to monitoring alarms is generally very high, thus casting fatal implications for seriously ill patients.

Title: Pergher, A. K. et al. (2014). Stimulus-response time to invasive blood pressure alarms: implications for the safety of critical-care patients. Revista Gaúcha de Enfermagem, 35(2), 135-141

Source:
http://www.scielo.br/

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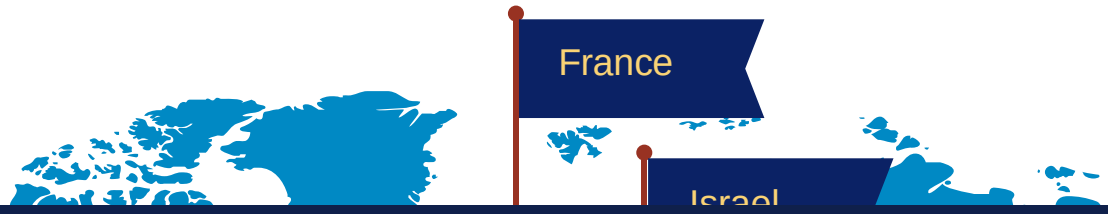

France

A study proved that the mere volume of false alarms in ICU or NICU creates noise pollution of more than 80db, resulting in alarm numbness and sleep deprivation in both patients and nurses. Even experienced nurses were able to identify life-threatening alarms by sound only in just 38% cases.

Title: Chambrin, M. C. (2001). Alarms in the intensive care unit: how can the number of false alarms be reduced?. Critical Care, 5(4), 184

Source:
http://paperity.org

Boston Globe

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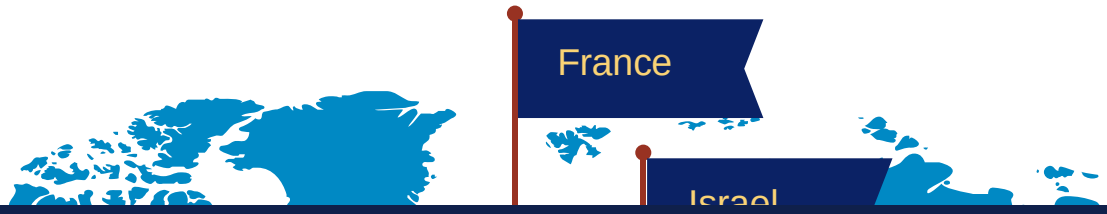

Australia

Several under-reported cases of alarm fatigue were brought to light as they caused an average 24 deaths in a year in Australia. Research stated that overworked healthcare professionals tune o the beeping alarms of medical devices that are used to monitor vital statistics of critically ill patients, thus causing deaths. A growing number of incidents are being frequently reported all over the country, owing to noise and alarm fatigue in hospital personnel.

Title: News.com.au

Source:
http://www.news.com.au

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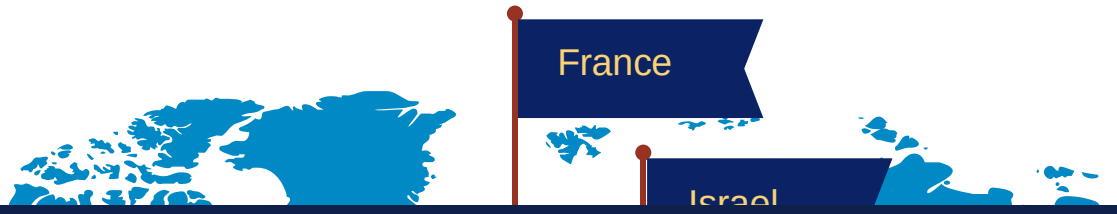

Korea

A study was conducted to investigate the number of clinical alarms in ICU, nurses' recognition of clinical alarms, and most common obstacles in alarm management. It was found that in one hour in ICU, 63.8% alarms were false alarms that resulted in alarm fatigue in nurses, thereby reducing their attention to critical alarms.

Title: Cho, O. M. et al. (2016). Clinical alarms in intensive care units: Perceived obstacles of alarm management and alarm fatigue in nurses. Healthcare informatics research, 22(1), 46-53

Source:
https://www.ncbi.nlm.nih.gov

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Source:
https://www.bostonglobe.com

Alarm fatigue:

a patient safety hazard