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X-Ray machine and ventilator synchronization




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Submitted 11 days ago
by Dr Julian Goldman

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Photo Gallery


A 32-year-old woman had a laparoscopic cholecystectomy performed under general anesthesia. At the surgeon's request, a plane film x-ray was shot during a cholangiogram.


The anesthesiologist stopped the ventilator for the film. The x-ray technician was unable to remove the film because of its position beneath the table. The anesthesiologist attempted to help her, but found it difficult because the gears on the table had jammed. Finally, the x-ray was removed, and the surgical procedure recommenced. At some point, the anesthesiologist glanced at the EKG and noticed severe bradycardia. He realized he had never restarted the ventilator. This patient ultimately expired.


The clinical scenario is that ventilation moves the diaphragm, blurring an x-ray image, requiring longer exposure time (worse with larger patients - longer exposure time). Currently, the ventilator is manually stopped to position x-ray components, the catheter in bile duct, then the ventilator needs to be turned off, all staff must leave the room, shoot the x-ray, all staff must come back in, and then finally turn the ventilator on.

The clinician can forget to manually turn ventilator back on, or it is turned off for an excessive amount of time, possibly causing patient hypoxic injury.

Machine-to-machine synchronization of the triggering of x-ray machine with ventilator, activating x-ray late in expiratory cycle, or make ventilator pause (prolong expiration) could prevent excessive or recurrent ventilator pauses. The x-ray machine would then obtain Patient id and patient demographic data (e.g. weight) from an EHR for exposure and documentation. This could also facilitate smarter alarms of devices.

Comments


ida_cide says:
One proposed solution is synchronization of triggering of x-ray machine with ventilator, activating x-ray late in expiratory cycle, or make ventilator pause (prolong expiration). Need to prevent excessive or recurrent ventilator pauses. The x-ray machine needs to obtain PID and patient demographic data (e.g. weight) from EHR for exposure and documentation. This should also facilitate smart alarms.
Posted 2 hours ago


Dr Julian Goldman says
Potential hazard with synchronization or triggering of devices is too tight coupling of systems. For example, the system may be unable to synchronize and the x-ray will just wait for the right time to shoot the film, but may never be triggered. Or, if the system is designed to pause the ventilator during inspiration (inspiratory hold), we wouldn't want the x-ray to be permitted to hold inspiration indefinitely if there was a delay in exposing the film.
Posted 10 minutes ago

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