Drowning Rule Out With Novices (DROWN) in Ultrasound

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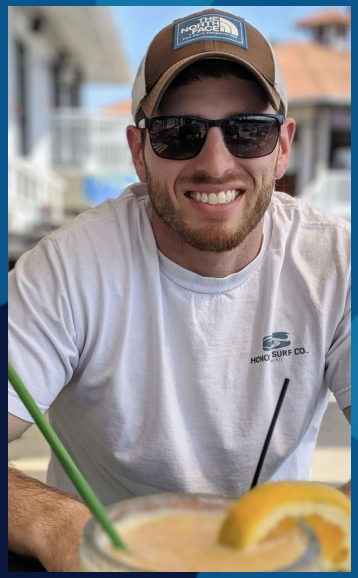

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Background

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CDC data from 2018:

- 9,659 incidents of nonfatal drownings in US.
- 2,481 drowning fatalities reported.
- One of leading causes of death in children less than 4 years old.

Age group	Cause of death ranking (2019)
1 – 4	2
5 – 9	3
10 – 14	5
15 – 24	6

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Objective

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The purpose of this study was to determine the utility of lung ultrasound in identifying interstitial edema in patients presenting after nonfatal drownings, when compared to chest radiography.

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Hypothesis

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Point of care lung ultrasound can identify interstitial edema in patients presenting after nonfatal drownings.

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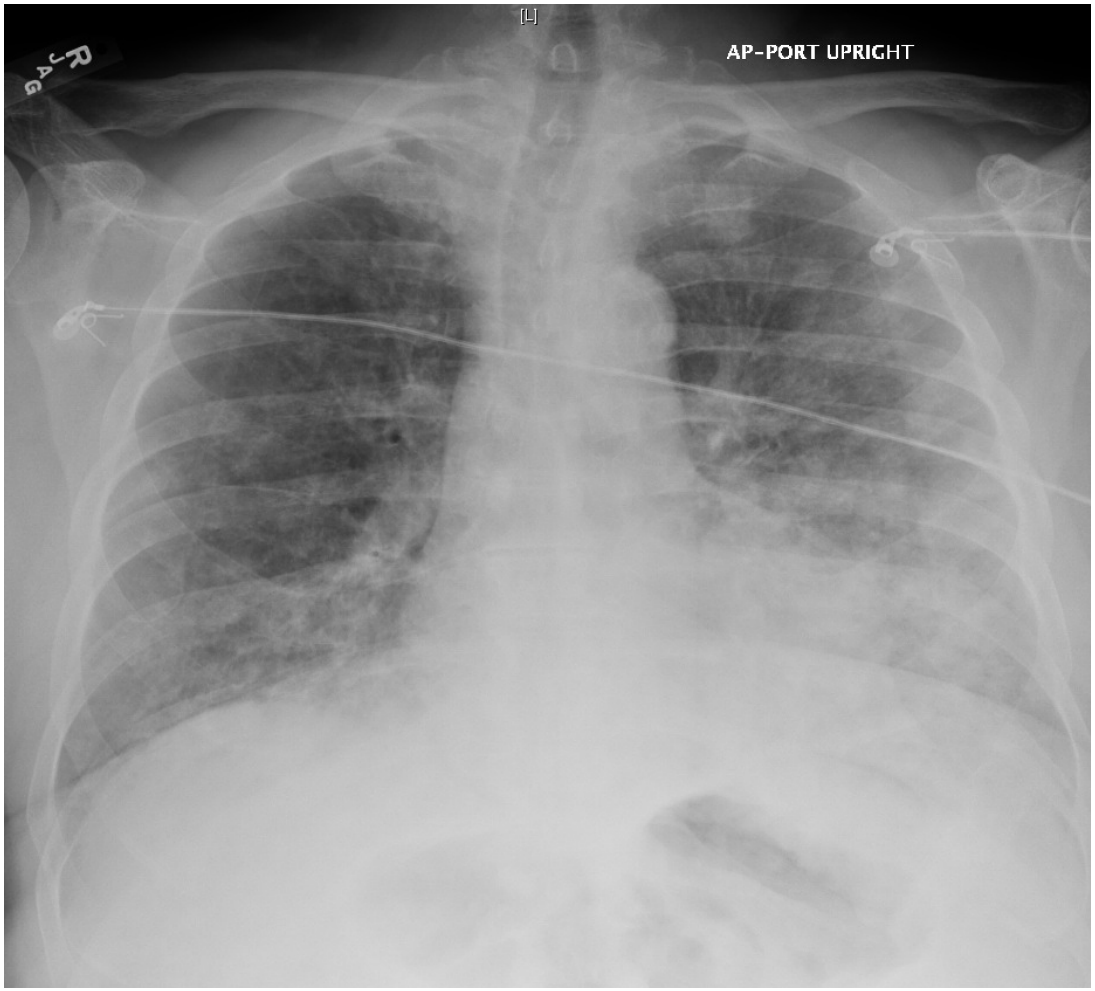

https://radiopaedia.org/cases/near-drowning-pulmonary-oedema?lang=us

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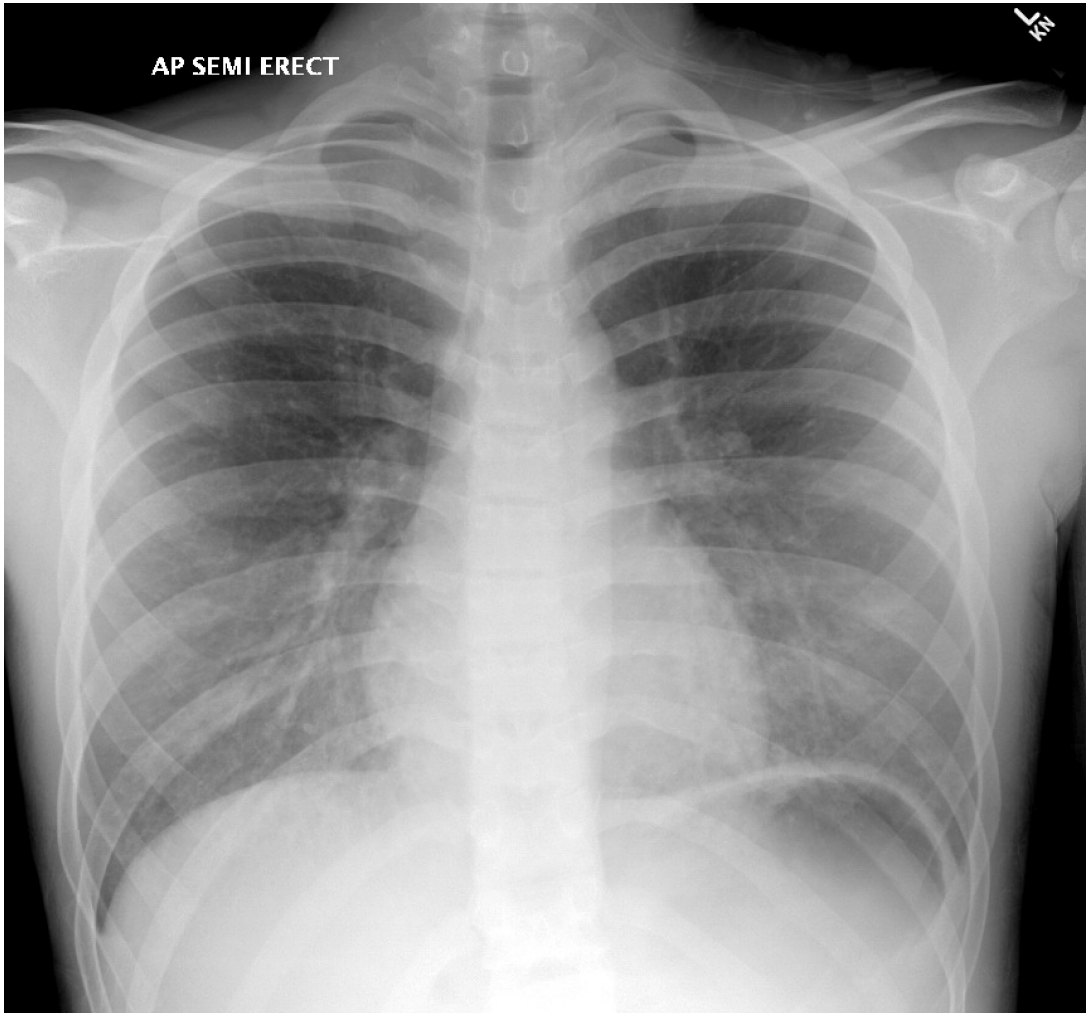

https://radiopaedia.org/cases/normal-frontal-chest-x-ray

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https://www.coreultrasound.com/lungs_cb/

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Methods

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- Study included all patients presenting after a submersion event who received a CXR.
- Study conducted in Myrtle Beach, SC at a single academic emergency department with annual census of approximately 125,000.
- US performed by EM residents not involved with patient's care using BLUE protocol.
- US reviewed by 4 blinded expert sonographers and results compared to CXR.
- Patients contacted 2 weeks later.

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Methods

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BLUE Protocol

- Bedside Lung Ultrasound in Emergency is helpful in determining etiologies of acute respiratory failure.
- EM residents were trained in the BLUE protocol and gave an initial “novice” interpretation of the bedside US they performed and blinded to the chest radiographs.

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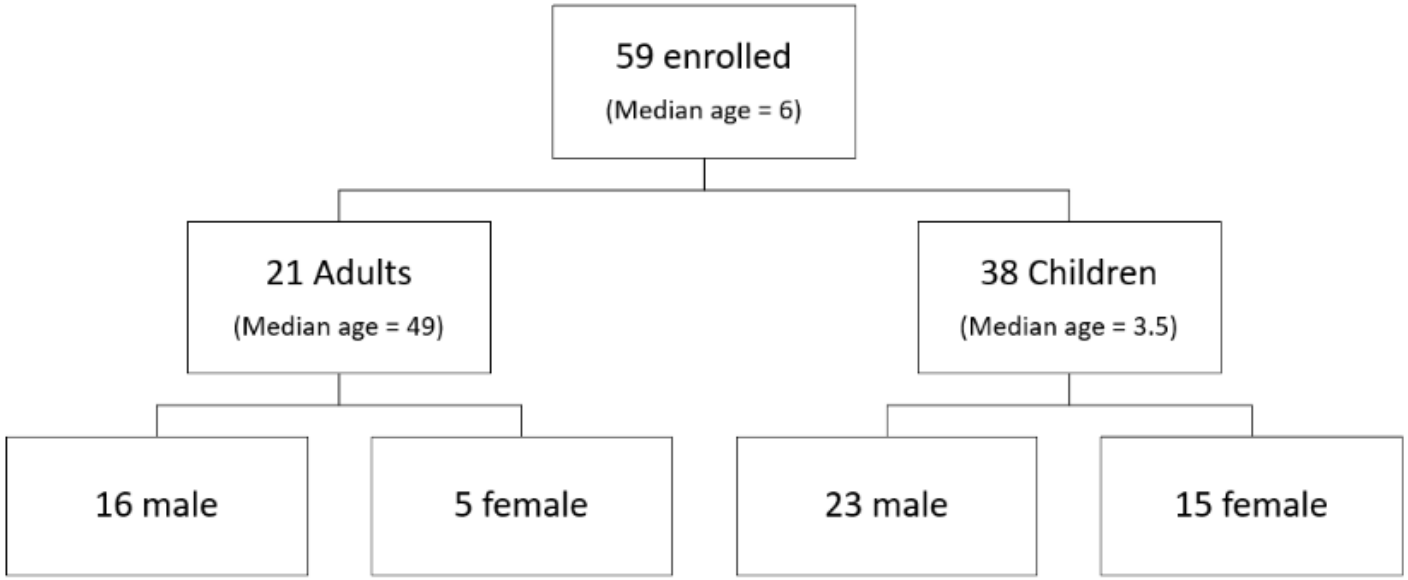
Methods



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Methods

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	Adult (n=21)	Pediatrics (n=38)
Seconds Underwater (median)	120	30
Bystander CPR	33%	26%
ED Disposition = Admitted	76%	53%
Intubated	31%	5%
Survived to discharge (or transfer)	94%	95%

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Results

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Sensitivity and specificity of Lung Ultrasound vs. Chest X-ray

All patients (n=59)	CXR (+)	CXR (-)	Sensitivity (95% CI)	Specificity (95% CI)
Ultrasound (+)	20	12	83.3% (62.6-95.3)	65.7% (47.8-80.9)
Ultrasound (-)	4	23		

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Results

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Sensitivity and specificity of Lung Ultrasound vs. Chest X-ray

Discharged patients (n=23)	CXR (+)	CXR (-)	Sensitivity (95% CI)	Specificity (95% CI)
Ultrasound (+)	2	2	66.7% (9.4-99.2)	90.0% (68.3-97.2)
Ultrasound (-)	1	18		

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Discussion

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- 24 patients had pulmonary edema on CXR, 20 of those had positive B lines according to novice interpretation.
- Compared to CXR, US resulted in 83.3% sensitivity and 65% specificity in detecting pathologic B lines in nonfatal drownings.
- 12 out of 35 cases where patient had negative CXR with positive lung US, 10 of which required admission for further treatment.
- Suggests US may detect significant pulmonary edema earlier than CXR.
- Ultrasound performed in patients discharged from ED with Sensitivity of 66.7% and Specificity of 90%.
- Interpretation of sensitivity and specificity may be biased as CXR was used as “Gold Standard” which is imperfect in identifying pulmonary edema.

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Conclusion

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- Diagnosis: Lung ultrasound is useful for determining presence of pulmonary edema in patients presenting after submersion events.
- Utility: So easy, even a novice can do it.

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Thank You!

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