Ventriculostomy Practice on a Library of Virtual Brains Using a VR/Haptic Simulator Improves Simulator and Surgical Outcomes

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This project was supported in part by a grant from the Agency for Healthcare Research and Quality to Dr Yudkowsky

The opinions expressed in this presentation are those of the authors and do not reflect the official position of AHRQ or the U.S. Department of Health and Human Services.

Disclosures

Drs Banerjee and Charbel: Owners/Partners in Immersive Touch Inc

Dr Luciano: Consultant to Immersive Touch Inc
Ventriculostomy
Component Skills

- Translate 2D CT images into 3D location and shape of ventricles
- Aim probe correctly
- Insert probe to correct depth
- Perceive density transition into ventricle
Immersive Touch®
Sensimmer®
Simulator

IMSH 2012
The trouble with task trainers...

- No clinical variation
- No range of difficulties
Would Ventriculostomy Practice on a Library of Virtual Brains Improve Simulator and Surgical Outcomes?
The intervention: Simulator Practice on 12 Virtual Brains

- View full CT scan
- Attempt to insert catheter into brain, using pre-drilled burrhole
- Check to see if successful
- “Open” brain to see where the catheter tip ended up
Simulator Pre/Post

- 3 attempts at each of 3 novel virtual brains:
  - Normal ventricle
  - Slit ventricle
  - Shifted ventricle
- Different brains presented pre and post
- Posttest brains presented at 1-month follow up.
Simulator Outcomes
Generalized Linear Mixed Models (GLMM)

- Relative to pre-intervention performance, residents were more successful immediately post-intervention (OR=3.43, 95% CI=[1.74, 6.77], p<.001) as well as at follow-up (OR=2.59, 95% CI=[1.24, 5.41], p=.011)

- Performance at follow-up was significantly worse than immediately post-intervention (p<.001)
Live Surgery Pre/Post

- Data from live procedures collected for about 6 months before, 1 month after intervention.
  - Successful cannulation
  - Success at first attempt
  - Ipsilateral vs contralateral
  - Lateral ventricle vs other space
  - Hemorrhage
Live Surgery Pre/Post
133 pre-practice, 47 post

- **Success at first attempt:** 72% vs 91%,
  - OR 3.76, 95% CI=[0.8, 16.4] p=.08
- **Lateral ventricle** vs other space
  - OR = 2.51, 95% CI=[1.19, 5.28], p=.02
- Ipsilateral vs contralateral 89%, NS
- Hemorrhage 5.6%, NS
Conclusions

- **Ventriculostomy practice on a library of virtual brains improves simulator and surgical outcomes**

  - **Simulator** provides unique immediate fb
  - **Library** provides a range of clinical challenges and difficulty levels
Next Steps

- Embed in curriculum for beginning neurosurgery residents
- Just-in-time training for non-neurosurgeons?
- Ultimate goal: practice on a projection of your own patient’s brain.
Thanks!

Professor Rounds
9:30
Row 1a, #3