

Need Statement

- **Intubation** is an **emergency procedure** required when a patient's **airway** is impaired.
- A **laryngoscope** helps view the **vocal cords** and provide allows for insertion of the **endotracheal tube**.
- **Suction catheters** are alternated with the laryngoscope to **clear** the airway of **secretion**, leading to **angioedema** and **acute epiglottitis** from repeated use.

We propose the SnapVac to **reduce visual obstruction** by fluids during intubation for ER patients, **thereby reducing the number of attempts for intubation** and risk of acute epiglottitis or angioedema in the airway.

Research

- In patients with **angioedema**, repeated intubation attempts can worsen **airway swelling**. (1)
- Angioedema involves soft tissue swelling that can significantly **obstruct** the **airway**. (1)
- **Video laryngoscopy** improves intubation success in angioedema. (2)
- Inscope Medical Solutions developed a **disposable laryngoscope** with a **built-in suction** port to improve visualization during direct laryngoscopy.
- The design is not compatible with video laryngoscopy, which is preferred in many clinical settings for its superior visualization.

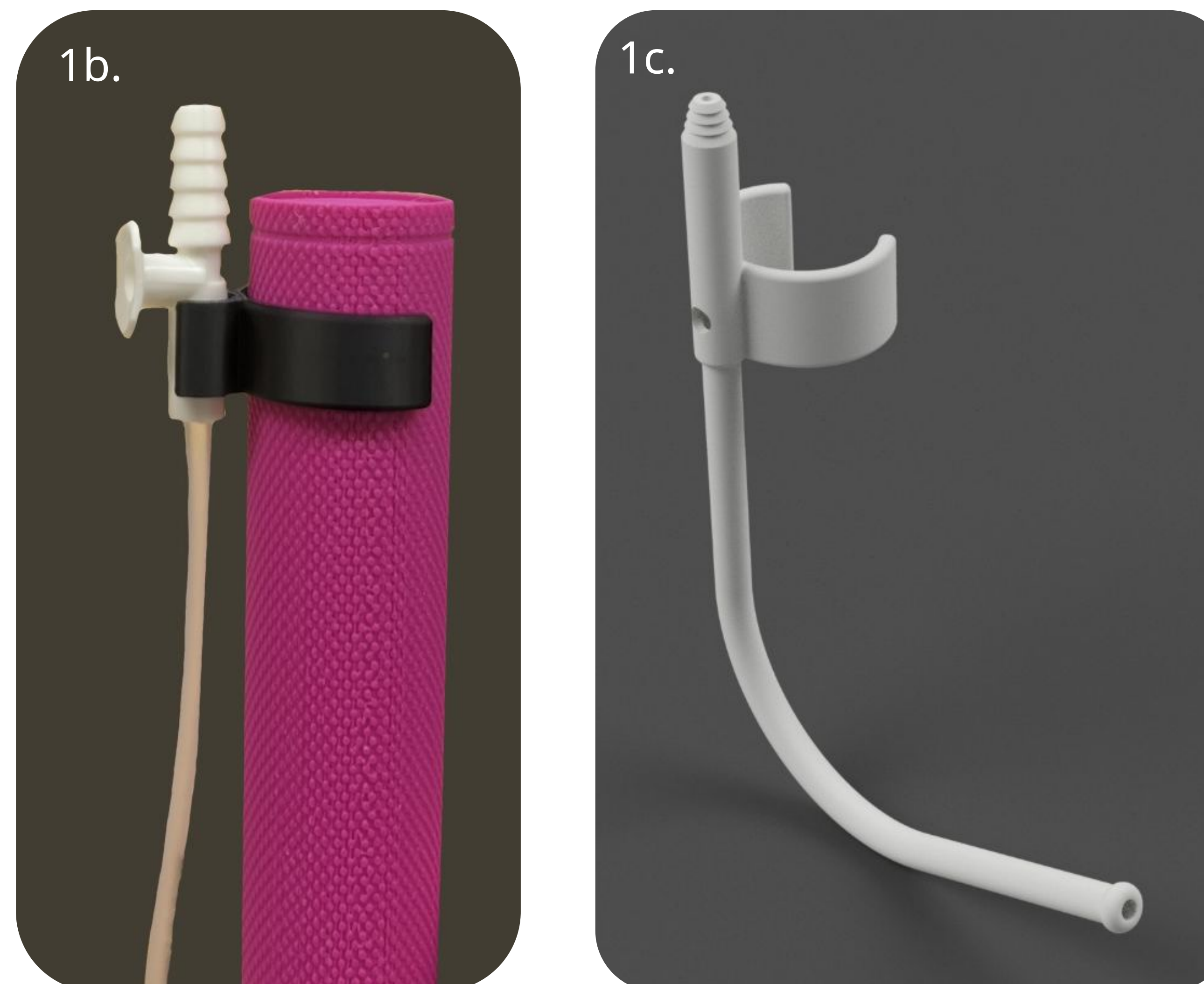
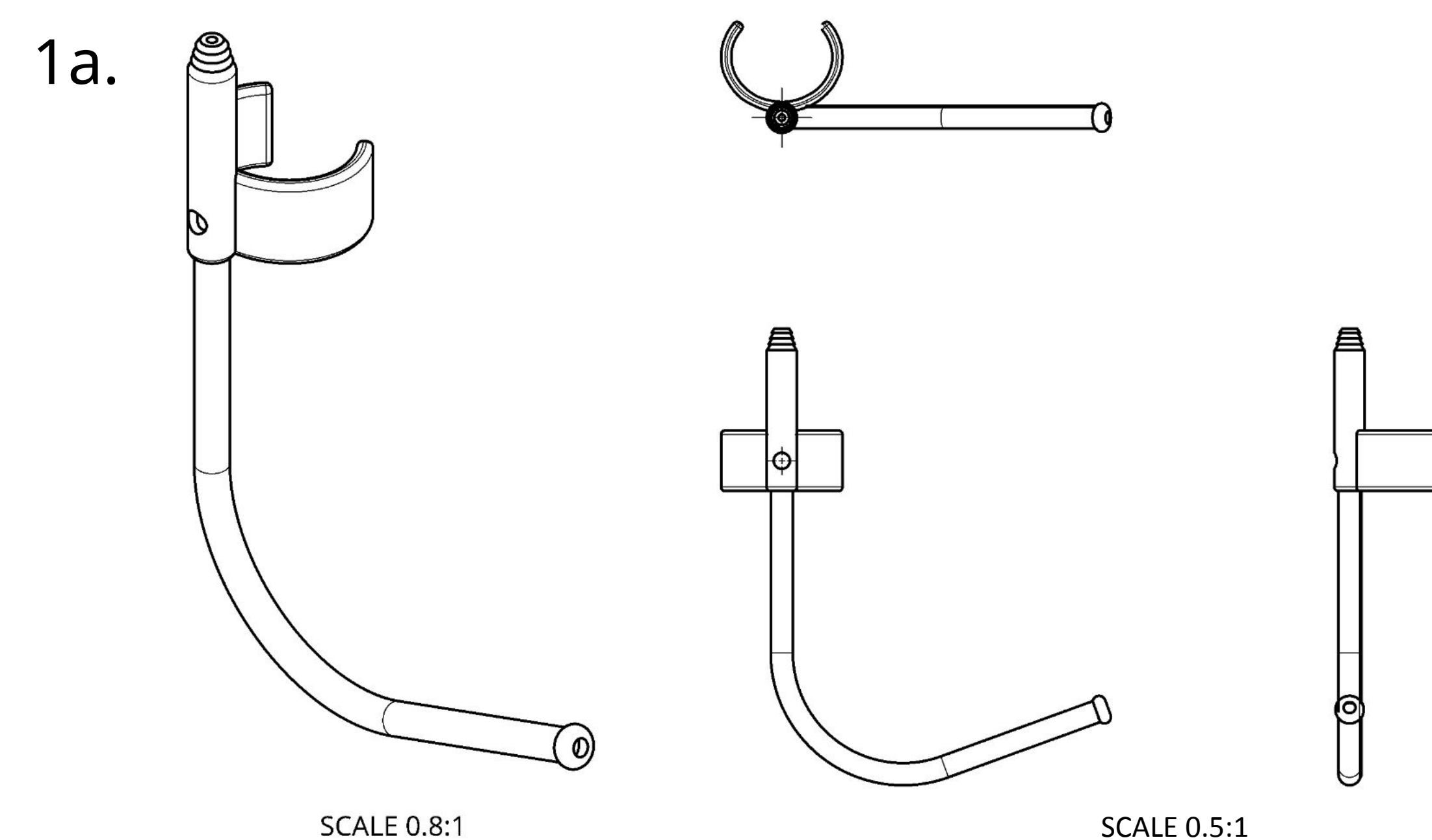
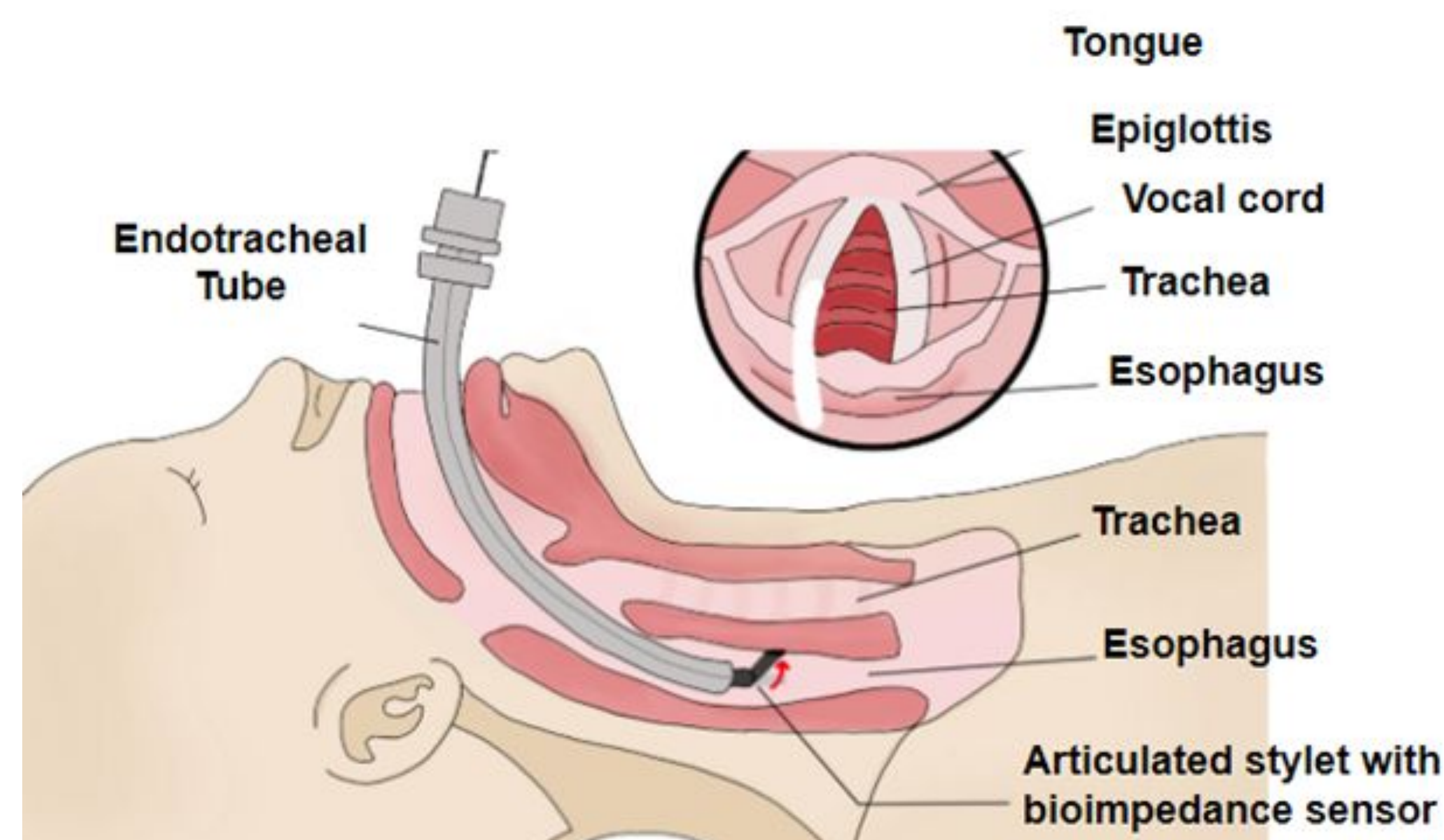


Figure 1. a. Full, top, side, and front view drawings of the SnapVac. b. The SnapVac attachment (white) attached to a model laryngoscope (pink). c. 3D render of the SnapVac.



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Methods

- Developed through an **iterative design process**.
- Initially consisted of multiple smaller components connected by **soft tubing** (see Figure 1b).
- **Four prototypes** with varying levels of functionality were then created prior to the final model.
- Each prototype was designed using **OnShape CAD software**.
- Final design was refined based on **clinician and expert feedback** and **testing considerations** using the **LoPro S3™**.

Design Details

- The current **SnapVac** is a single, rigid **3D-printed PLA** element.
- **Material selection** was based on **biocompatibility** and **sustainability** requirements.
- SnapVac securely **snaps onto** the **GlideScope** for easy attachment.
- Includes a **thumb-controlled leak window** that **regulates suction** flow during use.
- **Standard hospital suction** connects at the **top** of SnapVac.
- The **suction tube** extends down alongside the GlideScope camera to **clear secretions** that may obstruct visualization during intubation.
- **Future design** improvements include twisting the suction tube around the GlideScope, keeping the leak window on the right but **relocating the suction tip** to the left side (currently on the right) to avoid obstructing the path of the intubation tube.

References

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- (2) Wood, A., Choromanski, D., & Orlewicz, M. (2013). Intubation of patients with angioedema: A retrospective study of different methods over three year period. *International Journal of Critical Illness and Injury Science*, 3(2), 108-112.
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