

### Create a modular endoscope to maximize infection prevention and waste reduction, and maintain mechanical effectiveness and operator familiarity

#### What is ERCP?

Endoscopy is a minimally invasive medical procedure in which an endoscope, a surgical device used to examine a person's digestive tract, is inserted into a patient's gastrointestinal tract. Endoscopic retrograde cholangio-pancreatography (ERCP) is a specialized form of endoscopy dealing with procedures in the pancreatic and biliary ducts via the duodenum. Physicians performing ERCP use a specialized endoscope known as a duodenoscope.

#### Contamination

Current clinical procedures involve reusable endoscopes, which are cleaned and sterilized between procedures. This process is not only time and labor-intensive, but also fallible, leaving contaminants, including antibiotic-resistant bacteria, throughout the device. If that bacteria enters the patient, the ensuing infection is hard to treat and can be severe.

#### Exalt™ Model D

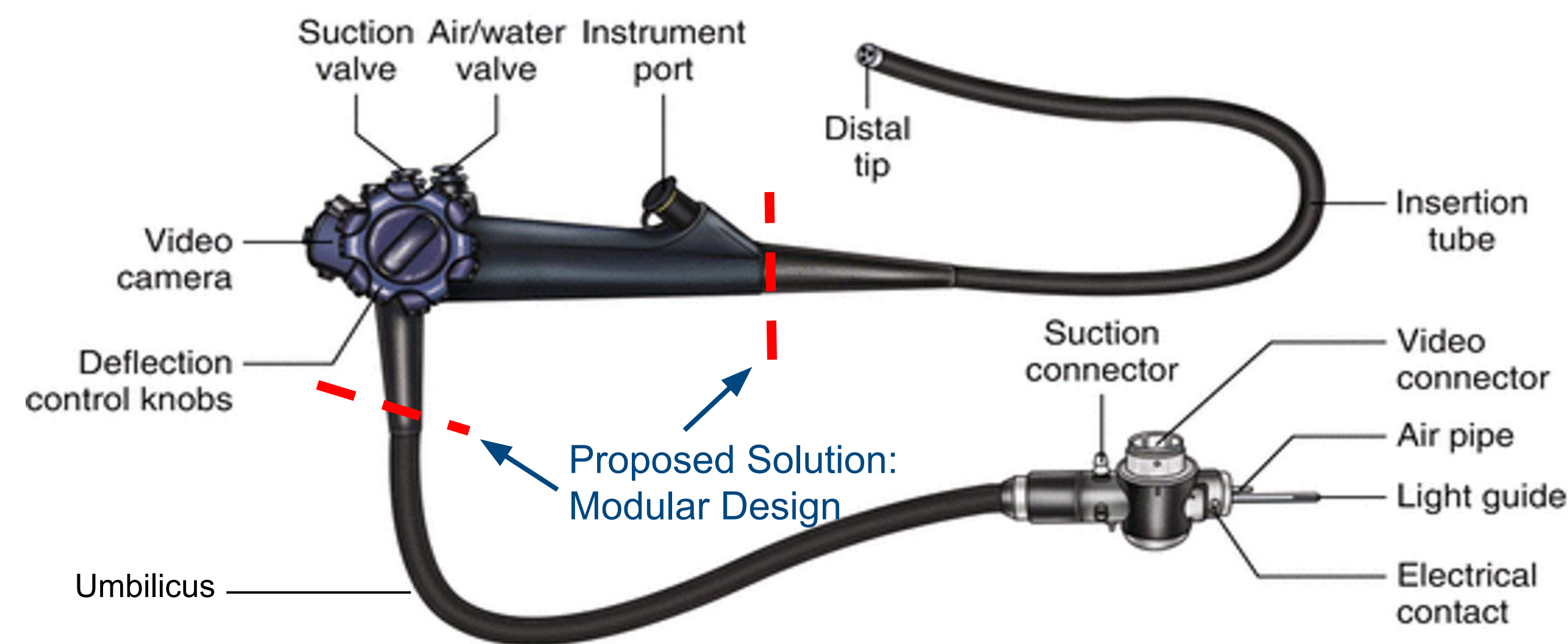
To help minimize infection and cross-contamination, BSC developed the Exalt-D, a fully disposable, single-use duodenoscope. However, it introduces a new source of waste and can present a packaging, shipping, and storage challenge. BSC was interested in reducing waste and creating more manageable packaging for hospitals.

#### Project Impact

- **Expense:** reusable duodenoscopes can cost \$40,000 and are used hundreds of times. *A fully or partially disposable endoscope offers the potential to reduce costs.*
- **Infection:** while cleaning and disinfecting happens between each use, the process can leave contaminants in the device. *Reducing use and simplifying cleaning of reusable parts protects patients.*
- **Waste:** BSC's Exalt-D, as with most single-use devices, creates medical waste through the device and its packaging. *Our design aims to reduce these.*

#### Anatomy of an Endoscope

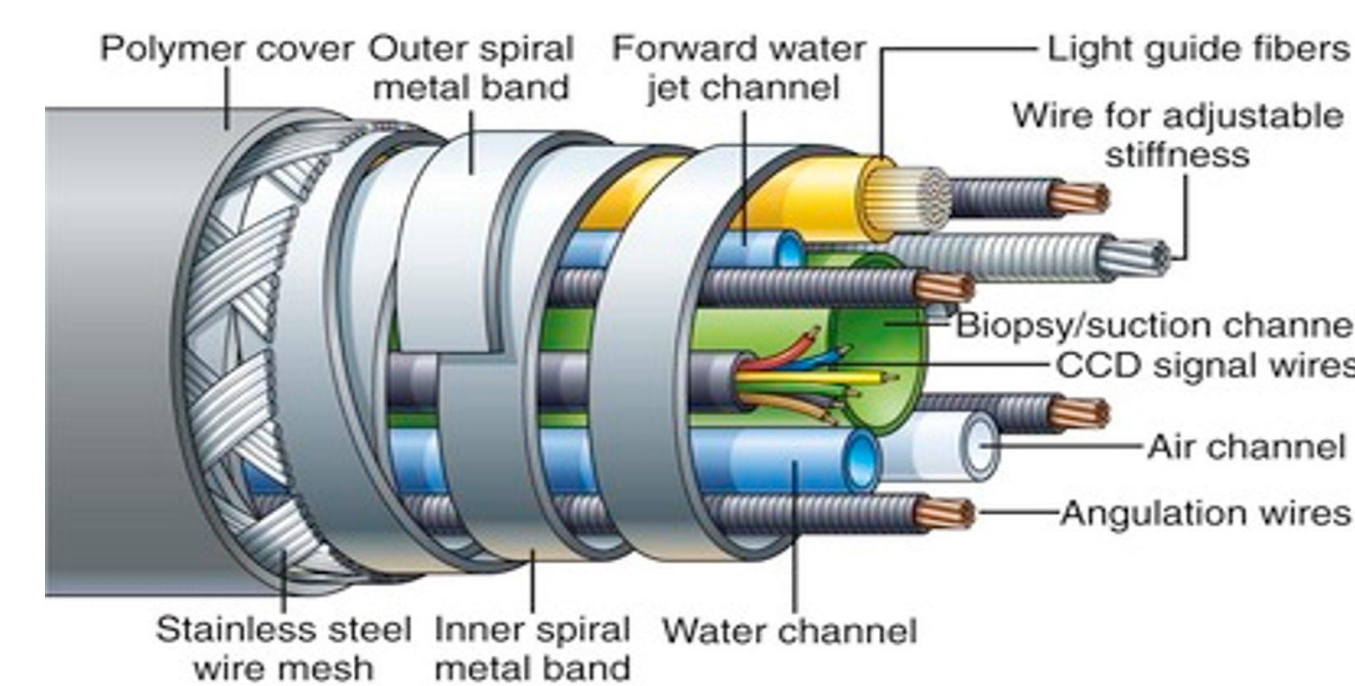
An endoscope consists of a **handle**, which the physician uses to control the tip of the device, **insertion tube**, which navigates through the patient's GI tract and through which additional tools are fed, and **umbilicus**, which connects the endoscope to air, water, and electrical components.



<https://abdominalkey.com/esophageal-anatomy-as-seen-during-endoscopy-and-basic-endoscopic-orientation/>

#### Proposed Solution: Modular Endoscope

We proposed to Boston Scientific a modular design that incorporates a reusable handle and disposable insertion tube and umbilicus. A major design challenge was to maintain functionality of angulation wires, fluidics channels, and electrical connections in a space the size of a dime.



<https://clinicalgate.com/how-endoscopes-work/>

#### Modular Design

In order to create a modular endoscope that aims to reduce the risk of infection and reduce medical waste, we created several detailed designs and physical prototypes of connectors, focusing on distal tip control wires and fluidics subsystems, which were sometimes in tension with each other, creating a modular endoscope that helps minimize infection:

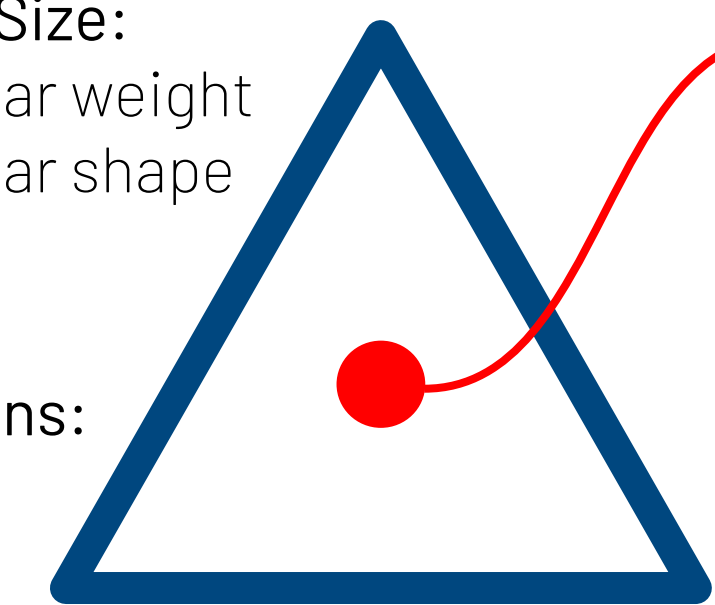
##### Smaller Size:

- Similar weight
- Similar shape

##### Robust Connections:

- Will not break
- Always lock properly

##### We Are Here



##### Fast Assembly:

- Few steps
- No delicate parts

#### End Products

- 40+** solution concept ideas
- 12+** connector prototypes
- 3** CAD endoscope designs
- 1** full prototype
- 1** intellectual property disclosure

#### Potential Benefits

This technology opens up new opportunities in endoscope design, as well as meeting the original goal of reducing waste.



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