Class Starters & Enders

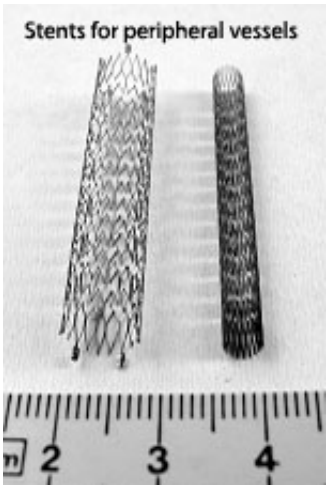
Making the Most of Instructional Time
Five Minute Lessons

Class Starters and Enders help utilize the last minutes of class when a lesson ends but there is not enough time to start another, or for an interest approach at the beginning of class. Mini-lessons correlate to GPS in the programs areas below.

Medical Textiles

Program Areas: Healthcare, Textile Science, Engineering & Technology

Instructions: Read the narrative and make notes of important points, answer questions, if provided, and be ready to discuss this topic.



Biotextiles are structures composed of textile fibers designed for use in specific biological environments where their performance depends on biocompatibility and biostability with cells and biological fluids. Biotextiles include **implantable devices** such as surgical **sutures**, **hernia** repair fabrics, **arterial** grafts, artificial skin, and parts of artificial hearts. Medical textiles are a broader group of textiles which expands upon biotextiles to include stitches, bandages, wound dressings, hospital linen, preventive clothing, etc. Antiseptic biotextiles are textiles used in fighting against bacteria growth on skin, and also fall under medical textiles. A great example of a medical textile is a **stent**: a stent is a tubular device made of woven metal mesh which is inserted into a tube into the body and expanded; afterwards, it remains locked in the open position, holding the tube open. A common usage of stents is to open blood vessels that have become clogged, as treatment for (or in order to prevent) heart attacks or other forms of **thrombosis**. After a stent has been placed, the body may perceive it as a foreign object, resulting in a process known as **restenosis** that causes the clog to re-form around the stent. An alternative which can minimize this risk is the drug-**eluting** stent, which slowly releases a drug to prevent cells around the stent from growing. Once the body has healed itself, the stent is no longer necessary, and its continued presence can interfere with future medical interventions or imaging; for this reason, research is being conducted into **bioresorbable** stents, which are made of advanced textiles, rather than metal, that slowly deteriorate and are absorbed harmlessly into the body. Research into new materials to make stents, as well as their construction, is an example of medical textile engineering. Artificial skin provides another application for textiles in medicine. For people who have suffered from traumatic burns or skin disease, one avenue of treatment is the implantation of artificial skin. Artificial skin comes in many forms, such as spray-on skin and skin grown in culture; cultured skin requires a **scaffolding** to be grown on, which is a textile. The development of a textile that is strong, flexible, **permeable**, and **biocompatible** enough to work in conjunction with cultured cells to replace skin, and to then dissolve once the new skin has successfully grafted, is a great challenge in medical textile engineering. An example of a smart textile has been developed by a company called Zephyr: the BioHarness suit, which is made from a fabric embedded with sensors that monitor the wearer's physiological conditions. It detects variables such as heart rate, respiration rate, skin temperature, posture and activity. Coupled with a **Bluetooth** connection and software, it allows for the recording and analysis of complex **biometric data**. Exercisers can use this technology to access extreme detail about their workout to optimize their routine. Coaches can monitor their athletes in real time to know when to cycle players out. As fabrics like these become more complex, they may have medical applications such as remote monitoring of at-risk individuals or diagnostic use. The possible applications are vast and exciting.

Review

1. What are stents and what do they do?
2. What are two forms of artificial skin treatments come in?
3. What are three examples of medical textiles?
4. What sort of patient would be treated with artificial skin?
5. Why is a bare metal stent not an effective long-term treatment?
6. What is the name of the process of a clog re-forming around a stent?
7. What applications can you think of on your own for the Bioharness?
8. What are the benefits of constantly receiving and updating vital biometric data?
9. What new technologies can you imagine that would make these textiles obsolete?
10. What are the current alternatives to the Bioharness for measuring biometric data such as heart rate?

Language Connection

Research and record definitions for these terms in notebook.

arterial	biometric data
Bluetooth	biocompatible
bioresorbable	biotextiles
devices	eluting
hernia	implantable
permeable	restenosis
scaffolding	sutures

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