Session 5: Impact of COVID-19 on plastics consumption, innovation, logistics and waste generation (including PPEs and wastes from Health Care Facilities) and related challenges
AGENDA

• Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers
  • Cardiovascular Devices
  • Neurosurgery Devices

• Waste Management in Healthcare: Design Considerations

• Design for Recycling
  • Case Study: Ventilators

• Design for Reusability
  • Case Study: PPE
Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers

Transcatheter Aortic Valve Replacement (TAVR)

Images courtesy: Edwards Lifesciences Inc., USA
Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers

Unadjusted Time-to-Event Analysis
All-Cause Mortality and All Stroke (AT)


SAVR: Surgical Aortic Valve Replacement
TAVI: Transcatheter Aortic Valve Implantation

P2A Surgery vs SAPIEN 3 TAVR

- Number at risk:
  - P2A Surgery: 944
  - S3 TAVR: 1077

- Months from Procedure:
  - 0: 805
  - 3: 786
  - 6: 757
  - 9: 743

- All-Cause Mortality/Stroke Rate (%):
  - P2A Surgery:
    - 0: 3.7%
    - 3: 9.7%
    - 6: 10.8%
    - 9: 18.8%
  - SAPIEN 3 TAVR:
    - 0: 0.0%
    - 3: 2.3%
    - 6: 3.4%
    - 9: 4.7%

- SAVR vs TAVI:
  - Anesthesia Time (min):
    - SAVR: 330
    - TAVI: 236
  - Total Procedure Time (min):
    - SAVR: 230
    - TAVI: 133
  - Median ICU stay (days):
    - SAVR: 5
    - TAVI: 3
  - Reoperation for Bleeding (%):
    - SAVR: 0.6
    - TAVI: 1.0
Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers

Delivery Catheter for TAVR Devices

[Representative Image]

Images courtesy: Medtronic Inc., USA

Balloon Catheter

[Representative Image]

Images courtesy: Terumo, Europe
Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers

[Open Heart] Surgical Aortic Valve Replacement (SAVR) Operating Room

Image courtesy: https://www.sciencephoto.com/media/903158/view/open-heart-surgery

Transcatheter Aortic Valve Replacement (TAVR) Operating Room

Image courtesy: https://wyomingmedicalcenter.org/pulse/dr-eric-munoz-offering-life-saving-tavr-in-wyoming-was-a-two-year-journey

SHIFT [Metal to Plastic]
Demonstration of Breakthrough Medical Devices/Equipment Using Plastics/Polymers

Stereotactic Surgery

Micro Stereotactic Surgery

SHIFT [Metal to Plastic]

Waste Management in Healthcare: REUSE and RECYCLE

Figure 1.
Disposal by percentage of the approximately 250 million tons of municipal waste generated in the United States in 2010 (Figure was created from data contained in reference [52]).

Figure 3.
Treatment of regulated medical wastes (RMW) by treatment method. (Figure 3 was created from data contained in reference [54]).
DESIGN for **RECYCLING**

Case Study: Ventilator/Oxygen Masks

SHIFT

[Metal to Plastic]

Images courtesy: https://sg.carousell.com/
DESIGN for RECYCLING

Case Study: Ventilator/Oxygen Masks

- As far as possible, the medical equipment should be designed in one polymer.
- An oxygen mask consists of a soft and hard part. It can be made either in PVC of varying softness [GOOD DESIGN], or of two different types of polymers [BAD DESIGN].
- Choosing the latter option means recycling is impossible, partly because of the plastics’ different melting points.

Images representative of products from Mederen Neotech Ltd, Israel

References: PVCMed Alliance; Danish Technological Institute
DESIGN for REUSE
Case Study: PPE for COVID19 Pandemic

Images courtesy: https://pngguru.com/ and Dupont Inc., USA
DESIGN for REUSE

Case Study: PPE for COVID19 Pandemic

REUSABLE PPE

• Novel PPE designed for reusability by Pune-based startup TRISHUL PPE Pvt Ltd
• Washable with detergent/bleach
• Sterilizable by Autoclave, ETO, H2O2
• Reusable up to 5 times
• Allows for waste minimization
• Allows for increased availability

Images property of Trishul PPE Pvt Ltd and Mogra Engineering Pvt Ltd
DESIGN for REUSE
DESIGN for RECYCLING

THE CIRCULAR ECONOMY

Product Reuse

Economic Cycle

Waste Management Cycle

End of Life

Product Manufacture

Packaging and distribution to consumer

Secondary Resources

Waste generation

Energy Recovery

Collection & Logistics

Recycling

Secure disposal of your PPE

Reference: www.greenham.com/medias
SUMMARY

• Breakthrough Medical Devices/Equipment providing significant clinical and economic benefit are possible due to innovations enabled by Plastics/Polymers

• Waste Management should be included as a critical Design Consideration in Healthcare
  • Design for Reusability
  • Design for Recycling

• Recommendations
  • Strengthen focus on Waste Management in Design Principles
  • More impactful incentives for Recycling
National Policy Workshop Webinar Series On Countermeasures for Riverine and Marine Plastic Litter in India
12–22 May 2020

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