

IIHMR UNIVERSITY, JAIPUR
EVENT OUTCOME REPORT
Master Class Episode 31

“Master Class Episode 31”
Topic: - 3 D Printing in Healthcare: Bio Printing Surgical Guides, Implants, Model & Drug Formulation
Date: 29 th May 2021 from 04.00 PM to 05:00 PM
Venue: - IIHMR University, Jaipur
Speaker: - Dr. Ragin Shah, Chief Academic Officer, US Institute of 3D Learning, California, USA
Number of participants: - 98
Introduction: - This session featured: Dr. Ragin Shah, Chief Academic Officer, US Institute of 3D Learning, California, USA. The event was moderated by Dr. Sheenu Jain, Associate Professor, IIHMR University, Jaipur and the Session was welcomed by Dr. P.R. Sodani, President, IIHMR University, Jaipur.
Objective: The main objective of this topic is to explore the transformative role of 3D printing technologies in modern healthcare, with a focus on how they are being applied in bioprinting, surgical planning, implant creation, anatomical modeling, and pharmaceutical formulation. It aims to provide a comprehensive understanding of how 3D printing is revolutionizing personalized medicine, clinical outcomes, and healthcare innovation.
Salient Novel Points Covered: 3D printing is revolutionizing healthcare with personalized, cost-effective, and high-precision medical solutions. <ol style="list-style-type: none">1. Bio-Printing of Living Tissues and Organs<ul style="list-style-type: none">• Advanced 3D bio-printers can print human tissues using bio-inks made of living cells.• Ongoing research is progressing toward functional organs for transplantation, potentially reducing dependence on donors.2. Patient-Specific Surgical Guides and Implants<ul style="list-style-type: none">• 3D printing enables custom-designed surgical tools and implants based on patient imaging (CT/MRI).• These tailored solutions enhance surgical precision, reduce operating time, and improve outcomes.3. Anatomical Models for Surgical Planning and Training<ul style="list-style-type: none">• Surgeons use 3D-printed replicas of patient organs or body parts to plan complex procedures.• Medical students benefit from hands-on practice using life-like models, improving educational outcomes.4. Personalized Drug Formulation<ul style="list-style-type: none">• 3D printing allows for precision dosage and release control in medications.

- Offers potential for on-demand printing of pills, especially in remote or underserved regions.

Role:

3D printing, or additive manufacturing, plays a transformational role in modern healthcare by enabling the creation of patient-specific, precise, and efficient solutions. Its versatility allows it to be applied across clinical, surgical, pharmaceutical, and educational domains.

1. Role in Bio-Printing and Regenerative Medicine

- **Creates living tissues using cells and bio-inks**, supporting regenerative medicine and tissue engineering.
- Enables the fabrication of **scaffolds for organ regeneration**, wound healing, and skin grafts.
- Research is advancing toward **printing fully functional organs** for future transplantation needs.

2. Role in Custom Surgical Guides and Instruments

- Produces **patient-specific surgical templates** based on 3D scans, ensuring **high surgical accuracy**.
- Reduces operation time, minimizes error margins, and improves surgical planning.
- Allows the design of **custom jigs, templates, and alignment tools** for orthopedics, neurosurgery, and maxillofacial procedures.

3. Role in Manufacturing Implants and Prosthetics

- Facilitates the creation of personalized orthopedic implants, dental prostheses, and cranial plates.
- Enhances biocompatibility, comfort, and functionality of implants using advanced materials like titanium and bioplastics.
- Speeds up delivery time and reduces manufacturing costs compared to traditional methods.

Challenges and Opportunities:

Challenges

1. High Initial Costs and Investment

- Equipment, materials, and setup for medical-grade 3D printing are cost-intensive.
- Smaller hospitals and clinics may face financial barriers to adoption.

2. Regulatory and Approval Hurdles

- Lack of standardized regulatory frameworks for 3D-printed medical products.
- Approval from bodies like the FDA, EMA, or CDSCO is complex and time-consuming.

3. Material Limitations

- Biocompatible and bioresorbable materials suitable for all types of implants or tissues are still under development.
- Not all printing materials meet clinical-grade sterility, strength, or safety standards.

Opportunities

1. Personalized and Precision Medicine

- 3D printing enables tailored implants, surgical tools, and drug dosages for individual patients.
- Boosts outcomes and reduces the risk of complications.

2. Rapid Prototyping and Innovation

- Greatly accelerates the development of new devices, implants, and prosthetics.
- Supports iterative design and fast feedback in research and product testing.

3. Revolutionizing Surgical Planning and Training

- Life-like anatomical models improve pre-operative planning, reduce surgical errors, and enhance medical education.

Q &A and Interactive Discussion:

An interactive session on 3 D Printing in Healthcare: Bio Printing Surgical Guides, Implants, Model & Drug Formulation was engaging, informative, and participatory to keep the audience involved while delivering valuable insights.

Future Scope:

The future of 3D printing in healthcare is vast, disruptive, and full of transformative potential. As the technology matures, it is expected to redefine how we design, manufacture, and deliver medical care, making healthcare more personalized, accessible, and effective.

Advancements in Bio-Printing for Functional Organs

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3 D Printing in Health Care: Bio Printing Surgical Guides, Implants, Models and Drug Formulation

Saturday, May 29, 2021
04:00 PM - 05:00 PM (INDIA)

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Dr. Ragini Shah
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US Institute of 3D Technology
California, USA

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President
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MODERATOR
Dr. Sheenu Jain
Associate Professor
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