ICAO DRONE ENABLE 2022

Drone Operations in Healthcare

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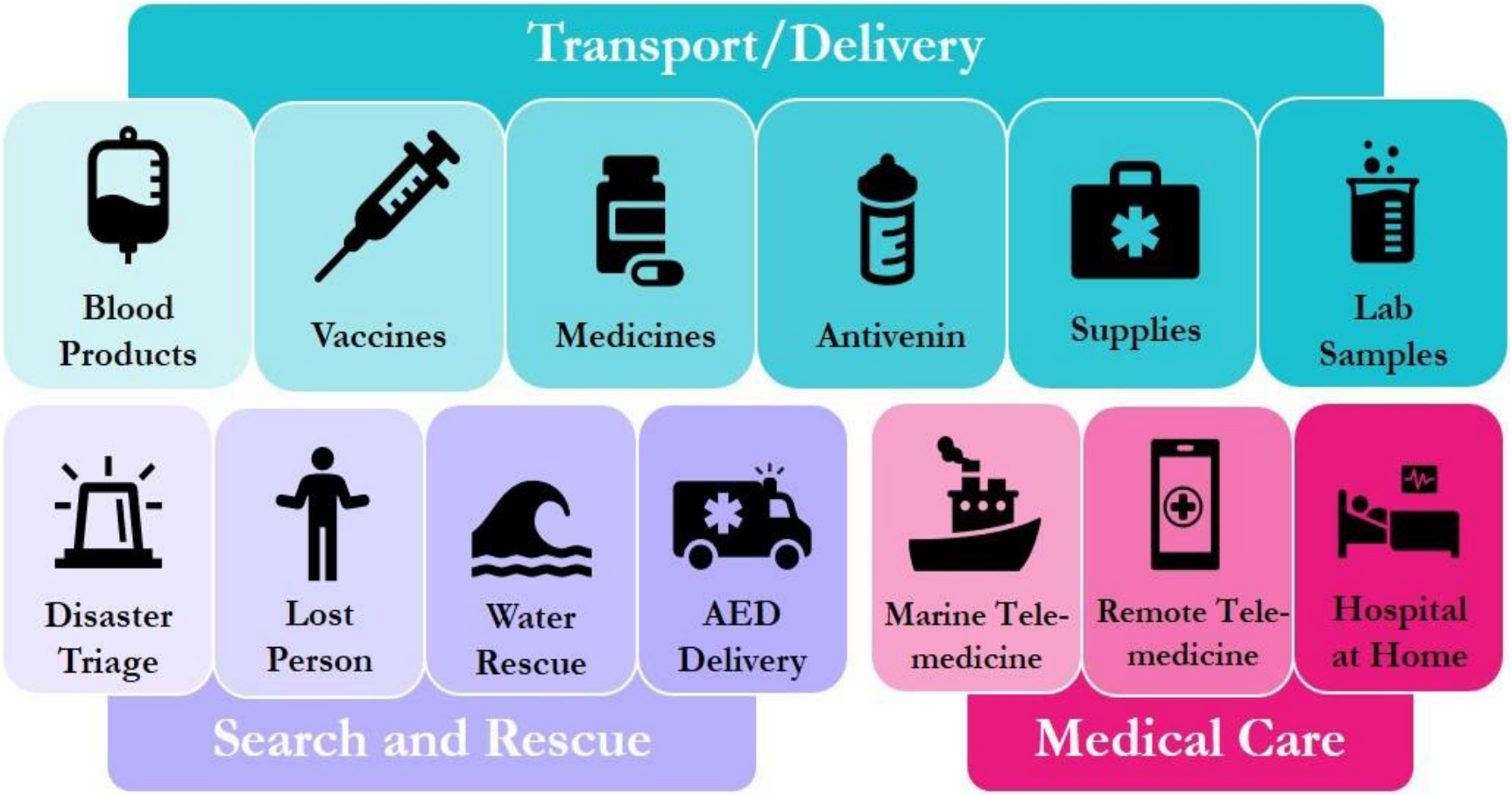
Advantages of drones in healthcare

- Access to remote areas/ difficult terrain/ maritime (ship to shore)
- Time saving – move samples in one hour vs. 6 hours or more (island communities)
- Enhance national health care capacity
- Improve patient outcomes
- Reduce waste of medical supplies
- Potential reduction in carbon emissions

Drone applications in healthcare



According to one report, the global medical drone industry is on track to reach about $643 million by 2027

- Humanitarian Aid
- Surveillance: disaster sites and biological hazards
- Epidemiology: research and tracking disease spread

Telecommunication: diagnosis, treatment, perioperative monitoring, tele-mentoring

Drone applications in healthcare

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Disease Control

- Drone-deployed Sterile mosquito release for vector control in Urban and Rural environments
- Track the progression of Malaria in the Philippines and Malaysia by monitor drone.
- Collection of medical samples (TB , HIV ,Ebola diagnosis, viral load) and delivery of vaccine , medication
- DRC eliminate yellow fever virus with 2,500 drone flights reaching 40 health facilities with 150,000 doses of yellow fever vaccine and lab samples.
- Bi-directional Ebola vaccine project

Drone applications in healthcare

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Supply Chain Support

- 2019: drone corridor in Malawi – vaccines for malaria, TB, rotavirus – later pharmaceuticals
- 2020 – delivery of temperature-controlled vaccines in the United States
- Drone delivery service for COVID Vaccines and tests in Africa, Scotland, Canada, India etc., during the height of the COVID-19 pandemic
- Jan 2022 – cholera and polio vaccines
- More and more states involve drones within the health supply chain system

Drone applications in healthcare

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Emergency Response

- Delivery of medical supplies, blood, defibrillators, emergency medication, pharmaceuticals in different parts of the world including the Africa, Germany , Bhutan, US, Papua New Guinea and others
- In 2021, 1st drone delivers lungs for transplant to a Toronto hospital, which saved a man's life

Drone applications in healthcare

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Routine medical care

- Small-scale delivery of non-prescription drugs
- Prescription medications directly to patients
- Telemedicine – patient assessment
- Tele mentoring – surgical procedures
- Tele monitoring e.g. quarantine during COVID-19

Medical concerns (drones in Healthcare)

- **Time-sensitivity**
  - Diagnostics /Lab Specimens: Window period in which transport is required, turn-around time may be as short as 2 hours
  - Organ transfers: between 4-36 hours depending on the organ type.

- **Temperature sensitivity**
  - controlled conditions – e.g. temp between 2 and 8 degrees Celsius
  - critical feature of vaccines is their dependence on a cold chain to maintain potency
  - Risk of freezing vaccines, which can render many antigens ineffective
  - Different temperature ranges
- Light and ultraviolet **light sensitivity**
- Hazardous **medical waste**

Medical concerns (drones in Healthcare)

Condition	Temperature range	Storage time
Transport of pre-processed blood	+20 °C to +24 °C	Less than 6 hours
Storage of pre-processed or processed blood	+2 °C to +6 °C	Approx. 35 days
Transport of processed blood	+2 °C to +10 °C	Less than 24 hours

Source: Abu Amin, Noryati, et al. "Manual on the Management, Maintenance and Use of Blood Cold Chain Equipment." World Health Organization Geneva. SAFE BLOOD AND BLOOD PRODUCTS.

- **Ethical**
  - Financial value vs. health value (payload small, but high value operation)
  - Consent and privacy
  - Medical confidentiality
  - Air ambulance developments

Other concerns (drones in Healthcare)

- **Regulatory**
  - Medical certification
  - Import/export of medications
- **Safety**
  - Payload capacity and range (battery life)
  - Loss of power and/or connectivity
  - Radio frequency interference and potential theft
  - Weather conditions, bird strikes
  - Night flights or flights over populated areas
- **Operational**
  - Vertical takeoff and landing capability
  - Packaging considerations
  - Limited data available
  - Operational training

Possible innovative solutions

- Power: Dynamic Parachute System
- Weather: Built-in Cooling and Heating System
- Connectivity: Beyond Visual Line of Sight (BVLoS)
- Harmonization

Avoid or decrease damage due to accidents

Address temperature concerns

Use Mobile/Satellite Networks with Radio Communications

Development of standardised practices

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Potential solutions

Collaboration – government, public & private partner cooperation, NGO, humanitarian aid organizations, funders and donors, industry partners, etc.

Engagement Mechanism

Develop innovative ways to streamline the process

Resources & Expertise Sharing

To use drones in the most impactful way

Educational Outreach to Public and the Industry

Build public confidence and acceptance

Industry Developments and Innovations

Unlock the full potential

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Thank You

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