Technology In Disasters Proposal for COVID-19 & MDO Medical Support
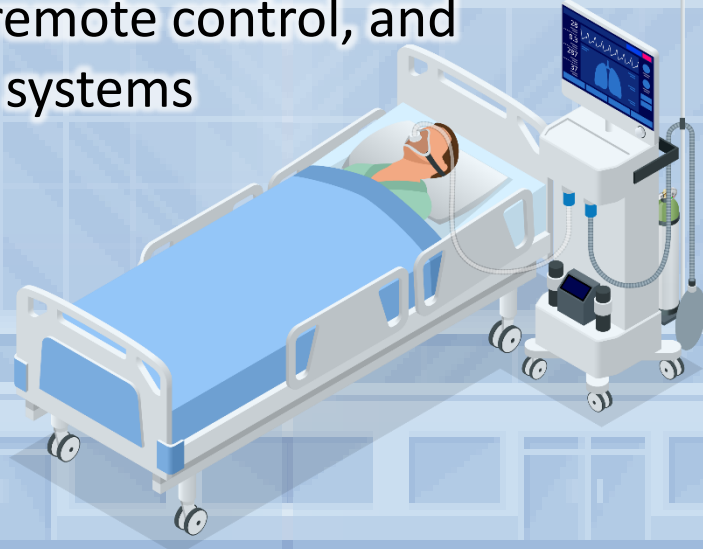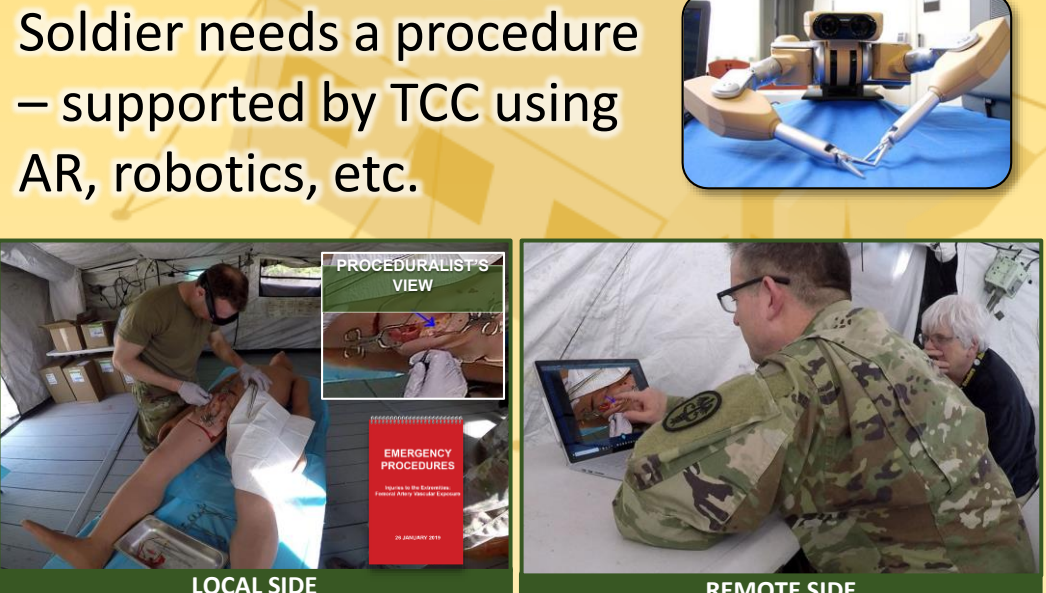
LOE	COVID-19	Technology Components	OPERATIONAL MEDICINE
	Area 0: Digital Health at Home — Personal Health Monitoring identifies possible infection	Health Sensors / Mobile Device Decision Support / Interventions and Procedures / Heads-up Augmented Reality	**Role 0:** Digital Health on Mission — Soldier status monitoring identifies optimal, ready, degraded, casualty
LOE-1	**Area 1:** Virtual Clinic — Patient might be sick – engages VH	Mobile/Home Physical Exams (PE) / PE with Movement/Manipulation / Home Meds/Vaccination Admin / Point of Care Testing / Tele-Mentoring/Coaching / Mobile Imaging & Diagnostics	**Role 1:** Virtual Clinic in a "Foxhole" — Soldier is not optimal – system nudges with decision support/recommendations, if degraded/casualty, system engages VH
	Area 2: Virtual Hospital Ward — Patient needs monitoring and is admitted to a virtual ward, monitored using mobile device, wearables, and medical monitoring devices if available	Home Acute Care Monitoring / Virtualized Care Clinician Workflows / IV Pump Management / Mobile Oxygen Delivery / Patient Positioning Equipment	**Role 2:** Virtual Hospital Ward at Tent — Soldier needs monitoring and is admitted to virtual ward, monitored using mobile device, wearables, medical monitoring devices if available
LOE-2	**Area 3:** Virtual Intensive Care Unit — Patient needs resuscitation – supported by TCC using remote monitoring, remote control, and autonomous systems	Continuous Patient Monitoring / Ventilator Support (Mech Vent) / Renal Support (CRRT) / Cardio Pulmonary Support (ECMO) / Clinical Nutrition Support / Invasive Procedures (Airway, A-line) / Blood Purification/Pathogen Reduce / Sedation and Anesthesia / Shock Resuscitation	**Role 3:** Virtual Intensive Care Unit — Soldier needs resuscitation and gets evacuated or, if not possible, is managed in PFC – both are supported by TCC using remote monitoring, remote control, and autonomous systems
	Area 4: Virtual Operating Rooms — Patient needs a procedure – supported by TCC using AR, robotics, etc.	Surgical Support – Telementoring/CDSS/Displays / Surgical Support - Robotics / Blood Recovery / Nanotech/Molecular Casualty Care	**Role 4:** Virtual Operating Rooms — Soldier needs a procedure – supported by TCC using AR, robotics, etc.

VH – Virtual Health, TCC – Tele Critical Care, PFC – Prolonged Field Care, AR – Augmented Reality

PROCEDURALIST'S VIEW
EMERGENCY PROCEDURES
LOCAL SIDE   REMOTE SIDE

Technology In Disasters Proposal for COVID-19 & MDO Medical Support

LOE	COVID-19	Technology Components	OPERATIONAL MEDICINE
LOE-1 / LOE-2 / LOE-3	**A. Synchronization & Workflow**	Virtual Workflows, Training, & Policy Dev	**A. Synchronization & Workflow**
		Secure, Standards-Based IoT Framework	
		Autonomous Data Entry	
		Home Health Virtualization Online	
		Clinic Virtualization Online	
		Hospital Ward Virtualization Online	
		Hospital ICU Virtualization Online	
		Operating Room Virtualization Online	
		Data Visualization - Predictive	
		Data Visualization - Volume/Acuity	
		Data Visualization - Resource Allocation	
		Simulation/Scenario Based Staff Training	
LOE-2	**B. Medical "Stuff" – Medication, Supply, Blood, Delivery & Fabrication**	Patient Care-to-Patient Services	**B. Medical "Stuff" – Medication, Supply, Blood, Delivery & Fabrication**
		3D Printing - Simple Devices	
		3D Printing - Complicated Devices	
		3D Printing – Bio-printing	
		4D Printing - Simple Circuitry	
		4D Printing - Complicated Circuitry	
		Artificial Fluids	
		Pharmacological Printing	
		Drone Delivery <10 lbs.	
		Drone Delivery >600 lbs. (CASEVAC)	
		Drone Delivery >600 lbs. (MEDEVAC)	

NETCCN

NATIONAL EMERGENCY TELE-CRITICAL CARE NETWORK

For more information on the TATRC Virtualized Hospital Architecture Maturity Roadmap, Please Contact:
US Army Medical Research Development Command – Telemedicine and Advanced Technology Center
marketingdirector@tatrc

TATRC

Tiered Staffing & Remote TCC Support

LOE-1

Phase I: Local Support

CC Trained Virtual-Physician

Pharmacist, other subspecialty trained clinicians

Ratio of Trained Clinicians to Patients
1:60

CC Trained Virtual-Nurse

Virtual RT

Ratio of Trained Clinicians to Patients
1:30

Non-CC Trained Physician (1:30-60) or APPs*

Non-CC Trained Nurse (1:10-30)

Non-CC medical assistants (aides, medics tech, etc.) (1:5-15)

Patients and family/friend bedside support (1:1 or 1:2)

VIRTUAL WARD

ICU Beds Map

Phase II: Wide-Local Support

Tele-Critical Care (TCC) Team

1:120
1:60

VIRTUAL WARD   VIRTUAL WARD

Phase III: Regional Support

TCC Team

1:>120?
1:>60?

Cohort of individual patients at their homes   Gymnasium   Hospital Ward   Rural ICU

Phase IV: Inter-Regional Support

Enabling Technologies:
- Cellular network/Mobile Devices
- Elastic Cloud Computing   LOE-3
- Internet of Things
- Big Data and Artificial Intelligence
- Augmented Reality

Complementary efforts:
- Incorporate additional sensors (wearables)
- Remote control of devices (ventilators/IV Pumps)   LOE-2
- Automated logistics/supply
- Automating devices/systems
- Device interoperability (plug and play)
- EHR Integration
- Robotic procedural support

Cohort of individual patients at their homes   Gymnasium   Hospital Ward   Rural ICU
VIRTUAL WARDS

Large Containment Areas (e.g. The Superdome)

Rural ICU   Hospital Ward   Gymnasium   Cohort of individual patients at their homes
VIRTUAL WARDS

Hospitals with ICU beds
Hospitals without ICU beds
No Hospitals

LEGEND:
Level of Effort
1   2   3

*APPs (Advanced Practice Providers: PAs, NPs, CRNAs etc.) – some are CC Trained and some are Non-CC Trained.