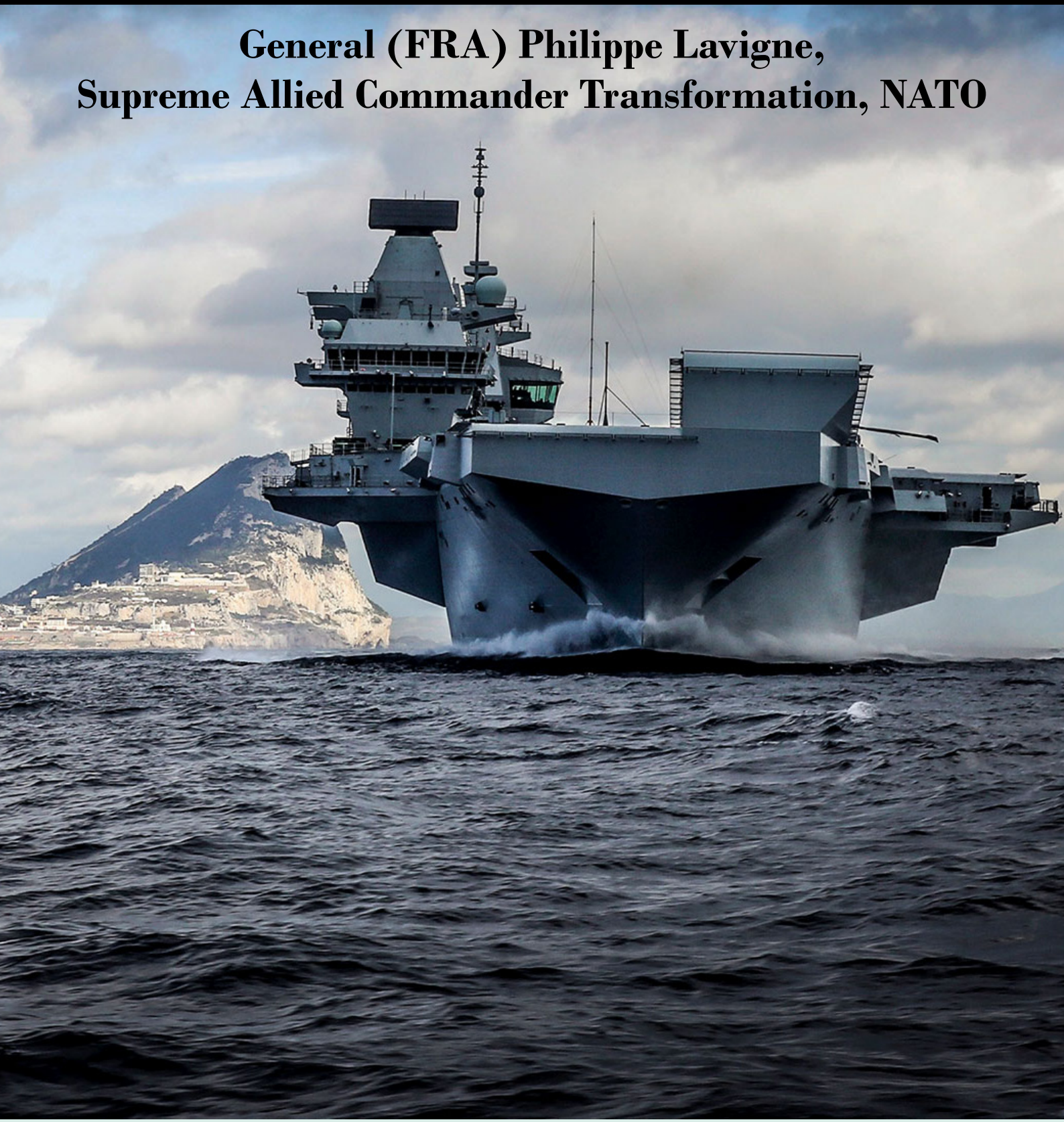
Defence Global

Land, Sea, Air, Security

May 2024 Edition

General (FRA) Philippe Lavigne, Supreme Allied Commander Transformation, NATO



UNMC | iEXCEL

Improving Human Performance & Effectiveness in Health Professions Education

iEXCEL in the Davis Global Center
University of Nebraska Medical Center, Omaha, NE

AR/VR HEALTH CARE CONTENT CREATION

- World-class creation team
- Precision, accuracy & realism
- 3D assets & modules for all platforms

REMOTE & DISTRIBUTED LEARNING

- Statewide & global connectivity
- Real-time collaboration
- Rural & remote outreach

CUTTING-EDGE SIMULATION TECHNOLOGIES

- Augmented & Virtual Reality (AR/VR)
- 3D & holographic imaging
- Interactive digital walls

SAFETY FOCUSED
OUTCOMES DRIVEN

UNIVERSITY OF NEBRASKA MEDICAL CENTER™
iEXCEL

Visit unmc.edu/iEXCEL to learn more.

Teaming with the Metaverse and GenAI to Advance Remote Healthcare Delivery

Many rural communities in the United States face challenges accessing high-quality and prompt medical care. It is estimated that over 60 million rural Americans are affected by access to health care, placing them at risk for less-than-optimal outcomes including premature deaths from heart disease, cancer, trauma, and stroke. The cause is multifactorial, ranging from a shortage of rural healthcare providers; closure risk faced by critical access hospitals; availability of training and upskilling opportunities; transportation challenges due to distance from home to hospitals, clinics, and imaging centers; and, in some states, a heavy reliance upon volunteer emergency responders.

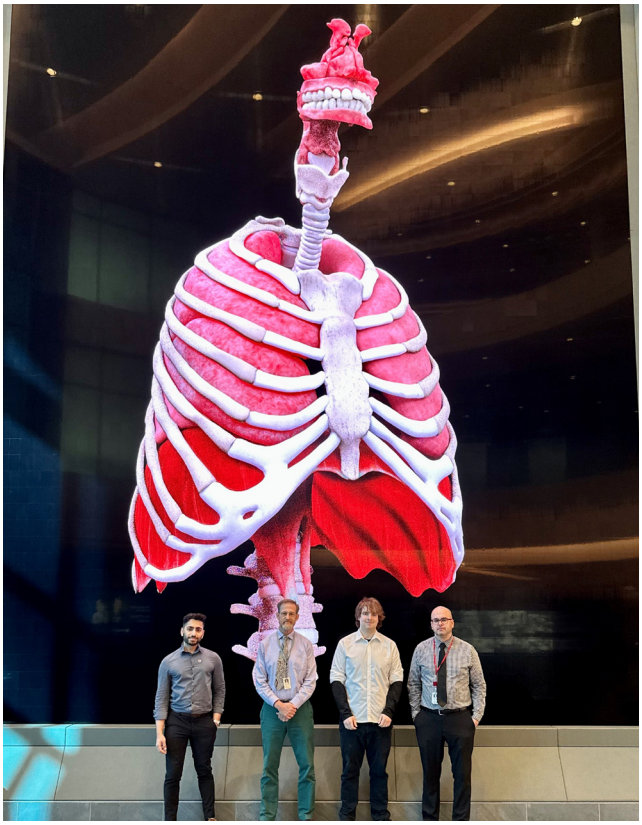
Meanwhile, health care is changing rapidly. As technology advances, so does the delivery of this care with, for example, the adoption of wearable devices, telehealth expansion and remote procedures via mini-surgical robots on the near horizon. Efforts are certainly being made to attract physicians, nurses, and allied healthcare professionals to practice in rural areas, however, the likelihood of supplying all remote regions with a highly trained, multi-specialty workforce is unrealistic for the near future. While the adoption of telehealth has expanded, particularly during the covid pandemic, this is limited to face-to-face consultations. Additionally, rural areas, in particular, experience telecommunication limitations including broadband and wireless challenges.

Stemming from extensive rural outreach experience and affected by lessons learned from the recent pandemic, iEXCEL's vision is to provide all rural health-care professionals and their patients access to synchronous, effective, evidence-based, innovative, mobile education. Achieving this will require transmitting real-time 2D and 3D imagery from all sources in iEXCEL, including immersive reality content and holograms, via a highly secure 5G, and eventually 6G, platform. Rural healthcare practitioners would have ready access to ultramodern training and upskilling through a network of shared, immersive, virtual experiences (the Metaverse) where relevant information is presented to healthcare practitioners and patients via generative artificial intelligence (GenAI). Patients and home caregivers would also have access to interactive 3D educational modules that aid them with the management of home health equipment or medical technologies. This protected network will ensure patients in rural areas receive help from the same high-quality, safe, and prompt health care as their urban counterparts. The ultimate impact would democratize healthcare knowledge and skills by bridging the rural-urban healthcare gap.

UNMC campus locations across Nebraska

Transforming Health Professions Education & Training

iEXCEL at the University of Nebraska Medical Center (UNMC) is working hard to bridge geographical care gaps by creating a seamless, remote, and integrated healthcare training platform. To achieve this goal, this game-changing initiative will require cybersecure, low-latency, high-speed capabilities to deliver high-quality content, collect data, and apply machine learning to the data collected that will improve healthcare for all, plus remove traditional barriers to tele-connectivity in rural states.


iEXCEL Visualization team with their 3D airway model

From the technical perspective, this project requires a delivery platform that supports bi-directional, mobile access for medical subject matter experts and patients, as well as the ability to send 3D, VR/AR, and holography (i.e., digital twins of patient scans and medical equipment) across the 500-mile-wide state of Nebraska. The goal is to deploy a user-friendly, intelligent tele-mentoring and tele-simulation system supporting a real-time, remote, distributed training and care model that provides unified services for rural healthcare professionals as well as patients. A comprehensive, statewide training and delivery model requires a centralized hub, such as an urban, academic healthcare system. Clinical subject matter experts would be available to provide tele-mentoring via tele-simulation for rural health providers when they need guidance with diagnostics, therapy and procedures and access to up-to-date consults with specialists in their field of practice.

Interacting with digital twin of C-Arm wearing HMD

Leveraging disruptive, immersive technologies based upon a medical metaverse that utilizes GenAI over a secure 5G/6G network will ensure equitable access to training – a significant and critical step towards transforming rural healthcare outcomes. This initiative will facilitate secure transmission of 3D patient data, digital twins of medical technologies and remotely guided surgical interventions. Transfers to urban tertiary care hospitals will be reduced by advancing mobile delivery of healthcare training across the 500-mile-wide rural expanse of Nebraska. This task requires a multidisciplinary, full-stack development team to create a cybersecure platform with scalable, cloud-hosted architecture to securely transmit and receive healthcare training data, test, as well as confirm, the transmission of immersive reality experiences for training and, eventually, patient care. This network development team is complemented by iEXCEL's Visualization Team, who are creating evidence-based, immersive reality healthcare assets. These assets continue to evolve in complexity and scientific integrity, further underscoring the value of this high-capacity network system.

Students interacting on digital walls connected statewide

Tele-simulation, Tele-mentoring, & Advanced Telehealth

As society recognizes the capabilities and opportunities for healthcare provided through the emergence of the Metaverse and Gen AI, the terms tele-simulation, tele-mentoring and telehealth are merging. This proposed ultra-secure, telecommunication platform would not only enable protected, ultramodern, rural healthcare training but also connect the emerging Medical IoT, decision trees, EMRs, web apps, advanced healthcare technologies, platforms, and adaptive protocols for real-world scenario testing.

This initiative aims to narrow the rural-urban healthcare divide by ensuring patients receive the same standard of care, enhanced by access to "just-in-time" provider training, from an academic medical center. The result will be a seamless bridge between urban and rural healthcare professionals, empowering rural healthcare workers to manage complex cases locally.

Recruitment and retention of rural healthcare professionals will also improve due to real-time access to subject matter experts at UNMC. This cybersecure platform supports rural clinics and front-line responders, while serving during crises, including pandemics and natural disasters, by ensuring equitable access to healthcare for all citizens.

Authors:

Pamela J. Boyers, Ph.D., Associate Vice Chancellor for iEXCEL, University of Nebraska Medical Center

Jeffrey P. Gold, M.D., Chancellor, University of Nebraska Medical Center and Executive Vice President and Provost, University of Nebraska System

James Wilroy, Director of Strategic Initiatives and Partnerships, KnowledgeBridge International

Special Acknowledgements:

iEXCEL Visualization team

Laurel Ybarra, Program Associate, Administration/ Marketing, iEXCEL, University of Nebraska Medical Center

UNIVERSITY OF NEBRASKA MEDICAL CENTER

iEXCEL℠

For further information visit:
University of Nebraska Medical Center
iExcel

https://www.unmc.edu/iexcel