Training the Next Generation Healthcare Practitioners to Create and Deploy Digital Health Solutions

Dayanjan Shanaka Wijesinghe Ph.D. - Associate Professor, VCU School of Pharmacy. wijesingheds@vcu.edu

What is Digital Health?

- **_Definition:_** Digital health encompasses a variety of technology-driven health care approaches including mobile health (mHealth), health IT, wearable devices, telehealth, telemedicine, and personalized medicine.

- **_Technological Components:_** Digital health technologies integrate computing platforms, connectivity, software, and sensors for health care and related applications. These range from general wellness apps to specific medical device applications.

- **_Benefits:_** Digital health provides comprehensive health data, offers patients more control over their health, and supports the prevention, early diagnosis, and management of diseases outside traditional settings.

- **_Impact:_** Technologies like smartphones and social networks not only change communication but also enhance the way we monitor health and wellness, increasing access to health information.

https://www.fda.gov/medical-devices/digital-health-center-excellence/what-digital-health

Aspect	Digital Health (DH)	Digital Therapeutics (DTx)
Scope	Broad range covering all digital technologies in healthcare.	Specific focus on software-driven interventions to treat, manage, or prevent diseases.
Purpose	Enhances health management, monitoring, and healthcare delivery across various aspects.	Delivers clinical outcomes and medical treatments through software programs.
Regulation	Varies widely; less stringent unless directly impacting patient care.	Strictly regulated as medical devices, requiring evidence of safety, efficacy, and quality.
Integration	Supplements healthcare practices and improves service accessibility and efficiency.	Integral to treatment plans, often prescribed by healthcare providers and closely managed.
Evidence and Outcomes	Focuses on general wellness, not always supported by clinical trials.	Requires clinical trials and real-world evidence demonstrating efficacy in treating specific conditions.

Digital Therapies are getting FDA approval

https://dtxalliance.org/products/dario-platform/

CureApp HT Hypertension Treatment Aid App® >
by CureApp
for Hypertension

d-Nav® >
by Hygieia
for type 2 diabetes

Dario Platform >
by Dario Health
for type 1 and 2 diabetes, hypertension

Daylight® >
by Big Health
for generalized anxiety disorder

EndeavorOTC® >
by Akili
for attention-deficit/hyperactivity disorder (ADHD)

EndeavorRx® >
by Akili
for attention-deficit/hyperactivity disorder (ADHD)

Freespira® >
by Freespira, Inc.
for Post-traumatic stress disorder (PTSD), panic disorder, panic/anxiety attacks

gameChange® >
by RealizedCare
for Agoraphobic avoidance and distress

HelloBetter® Chronic Pain >
by GET.ON Institut für Online Gesundheitstrainings GmbH
for chronic Pain

HelloBetter® Diabetes >
by GET.ON Institut für Online Gesundheitstrainings GmbH
for depression in people with diabetes

Why train future healthcare providers in DH/DTx?

- **_Direct Clinical Insight_**: Providers identify and address specific healthcare needs through direct patient interactions and real-world testing of digital solutions.
- **_Expertise and Validation:_** Leveraging medical expertise, providers ensure that digital tools are safe, effective, and meet clinical standards.
- **_Ethical and Regulatory Guidance:_** Uphold ethical standards and navigate regulatory requirements to ensure compliant and equitable digital health solutions.
- **_Enhancing Patient Engagement:_** Educate and engage patients directly to improve adoption and effectiveness of digital therapies.
- **_System Integration and Personalization:_** Drive personalized medicine and integrate new technologies into existing healthcare systems efficiently.

Currently no formalized training for DH/DTx for the future healthcare workers

What are the challenges?

- **_Curriculum Integration:_** Fitting new digital health content into an already full curriculum is a significant challenge. Deciding what existing content to modify or replace requires careful consideration to ensure that students receive a comprehensive education without overwhelming them.

- **_Rapid Pace of Technological Change:_** Digital health technology evolves quickly, making it difficult to keep educational materials up-to-date. This rapid pace can lead to a gap between what is taught and the current state of the art in professional practice.

- **_Limited Hands-On Opportunities:_** Access to the latest digital health technologies for practical training is limited by high costs and logistic complexities. Creating opportunities for hands-on learning is crucial for effective training but difficult to implement within the constraints of traditional educational settings.

- **_Resource Constraints:_** Developing and maintaining digital health training programs requires financial investment, skilled educators, and cutting-edge technology. With tight budgets and limited room for expanding faculty and facilities, these resources are often difficult to secure.
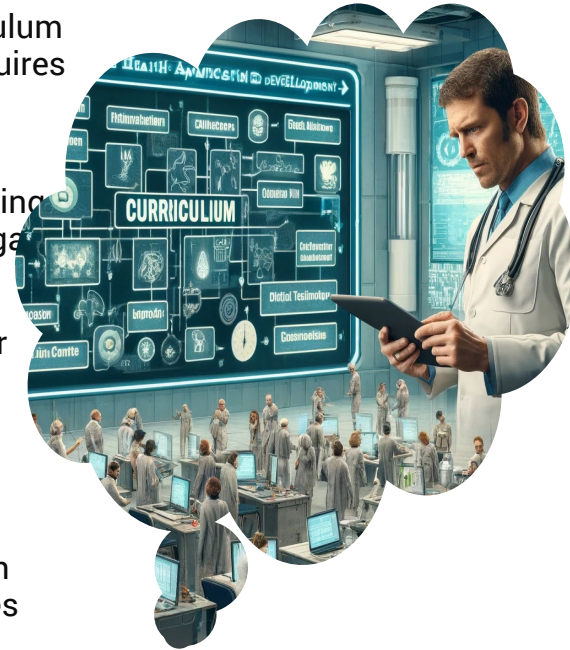
How did we solve these challenges and integrate DH/DTx application development into the PharmD curriculum?

Educating healthcare students in DH/DTx

- *<u>Extracurricular Learning</u>*
  - Created a global student organization - a 501(c)(3) dedicated to lifelong learning of DH/DTx
  - Promote participation in healthcare hackathons
  - Classroom space to get together and brainstorm and prototype (Digital Health Lab)

- *<u>Curricular Learning</u>*
  - 3 credit elective in P3 year
  - Semester long research elective on DH/DTx
  - Advanced Pharmacy Practice Elective in Digital Health - 5 week rotation

- *<u>Experiential Learning Opportunities</u>*
  - Industry internships, fellowships and residencies

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Pharmacists for Digital Health (PDH)

- Extracurricular DH/DTx training needed for the Next Generation of Pharmacists

- Solution for fast paced learning needs

- PDH (_Emily Ko & Amir Behdani_) created to provide supplemental training

  - 3 talks on DH/DTx from experts/semester

  - 1 workshop for DH/DTx skill building

  - Training to participate in health hacks

  - Space to try out new ideas on DH/DTx

  - https://www.linkedin.com/company/rxdigitalhealth/posts/?feedView=all

Democratize Digital Health Management with myDigitalARC – Analytics and Responsive Care

July 5, 2021 — by Emily Ko & Amir Behdani & Briton Vanmaanen & Stefan Helfrich

Pharmacy student group aims to bridge the digital divide in health care

Pharmacists for Digital Health has earned national recognition for increasing access to medical technologies for low-income patients.

The Internet of (Medical) Things is impacting healthcare positively. Continuous long term monitoring of patients' health parameters allows healthcare professionals to intervene earlier and potentially save lives, patient time, and money through better utilization of healthcare resources. And yet many millions of people in the U.S. are living in poverty with limited access to healthcare and digital health technologies.

Limited access to typical digital health technologies and resources to send digital health information, e.g. smart devices or reliable access to the internet, among people of low socioeconomic status means that these people are being left behind. And on the clinic side, restricted budgets mean that clinics may have to forgo programs that could help improve or reduce the cost of chronic disease management.

- In the U.S. chronic disease management makes up 75% of visits per year to free clinics
- 88 million Americans have pre-diabetes but 84% are not aware of it
- 108 million Americans have high blood pressure and only 24% have it under control
- 50 million in the U.S. live in poverty with limited access to healthcare

The team at Virginia Commonwealth University (VCU) of Amir Behdani, Briton Vanmaanen, and Emily Ko, have developed a solution using KNIME software and Amazon Web Services that will democratize digital health management. Amir, Briton, and Emily are Pharm.D. candidates at the Virginia Commonwealth University School of Pharmacy and founding members of Pharmacists

Authors

Emily Ko

Emily Ko is a Co-Founder of Pharmacists for Digital Health and first-year Pharm.D. candidate at VCU

⊕

Amir Behdani

Amir M Behdani is a Co-Founder of Pharmacists for Digital Health and first-year Pharm.D. candidate at VCU

⊕

Briton Vanmaanen

Briton Vanmaanen is a founding executive member of Pharmacists for

Promoting Innovation/Entrepreneurship

Left Post

VCU da Vinci Center
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"I want to talk a little bit about what I saw. What I saw were six awesome pitches, a lot of diversity of skill, of thought, of people, and great ideas that have been going from zero to one." -Isaiah Harvin at VCU Demo Day 2022

Congratulations to the teams that earned Seed Funding Awards!
C'est La Vie, Entrepreneur: Yosef Mirakov Cohen
KBHealthTech LLC, Entrepreneur: Amir M Behdani
Noodlers, Entrepreneur: Peyton Spangler
Better2Gether, presented by entrepreneurs: Bella Lubinskas, Brenna Gill, Hayden Taylor

Speaking of Better2gether RVA, congratulations to that team for winning the People's Choice award. The people spoke and they chose you.

Watch the student pitches and full Demo Day event on YouTube:
https://lnkd.in/gp24znBz

[Garret Westlake] You've heard a whole lot about da Vinci.

Play
0:46
CC
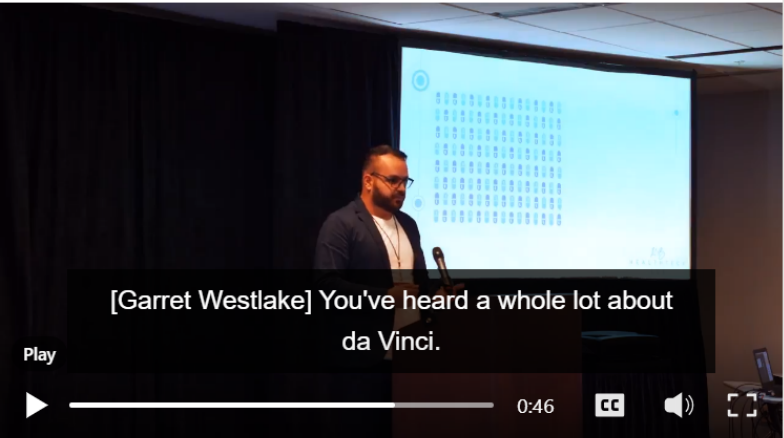
VCU Demo Day 2022 Highlights

Right Post

Amir M Behdani • 1st
Pharm.D Candidate, Co-Founder at Pharmacists for Digital Health, Co-Found...
1mo • Edited • 🌐

•••

I am so excited to announce that I will be joining the Bristol Myers Squibb team this summer as the data management & data science Intern.
I want to especially thank my mentor and advisor, Dr. Dayanjan Wijesi ...see more

Bristol Myers Squibb™

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P3 Elective - Introduction to Data Science and Rapid Prototyping - 3 credits

- Code free data science
  - KNIME L1DS, L1DW, L2DS, L2DW

- Extended Reality application development for DH/DT

- Rapid prototyping health devices with microelectronics

- Rapid prototyping with 3D printing

Final project is published as a blog post

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KNIME-Med-Chat-Bot: A Low Code Solution For AI Driven Conversational Information Extraction from Clinical Practice Guidelines

Bridging the gap between complex medical guidelines and everyday users with visual programming

Heparin Therapeutic Monitoring and Calculation with KNIME

A codeless solution for adult general cardiovascular, and adult and children's deep vein thrombosis and peripheral edema

Sebastian Jaques, *Amir Behdani*, *Micah Buller*, *Gina Chong*, *Maria DePonte*, *ReHanshae Harvey*, *Dori Leka*,

Advanced Pharmacy Practice Elective

5-week experiential rotations in the P4 year - DH/DTx bootcamp prior to graduation

- **_Week 1_**
  - Principles of data science (data import, cleaning, transformation and validation) - KNIME L1DS, L1DW, L2DS and L2DW
  - Identify 1 main project and 1 backup project.
- **_Week 2_**
  - Introduction to Machine Learning Algorithms - L4-ML
  - Applying principles of design thinking
  - Microelectronics and robotics
- **_Week 3_**
  - Introduction to Deep Learning L4-DL
  - Introduction to Extended Reality
  - Web application development
- **_Week 4_**
  - Generative AI application Development
  - Predictive and descriptive health data analysis with KNIME
- **_Week 5_**
  - Project completion
  - Project publication

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Automating Pharmacokinetics Calculation in KNIME

November 29, 2022 — by Danielle Holdren & Dayanjan Wijesinghe

Using an Automated Tool in Clinical Practice for Efficient PK Calculations

Pharmacokinetics is a branch of pharmacology that provides insight on how the body responds to a drug. It encompasses processes such as **A**bsorption, **D**istribution, **M**etabolism, and **E**xcretion (ADME), which can be used to determine how efficient and how safe a drug is. Clinicians use pharmacokinetic parameters and calculations to visualize and interpret each of the phases of ADME as they monitor a drug's action in vivo.

Each phase of ADME is associated with specific pharmacokinetic parameters. For example, the absorption and distribution phases of ADME can be extrapolated from drug concentrations and volumes, while the metabolism and excretion phases may be illustrated by parameters such as the elimination rate constant and clearance. Other considerations include the route and method of drug administration, which also plays a role in the body's response to a drug. In practice, each of these pharmacokinetic parameters can be calculated, and a treatment approach can be

Authors

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Danielle Holdren is a 4th year pharmacy student at VCU School of Pharmacy in Richmond Virginia. She

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How a Data App Improves Vancomycin Dosing in Obesity

September 9, 2022 — by Danielle Holdren & Dayanjan Wijesinghe

Timely Vancomycin Area-Under-the-Curve-Based Dosing for Informed Decision-Making

Vancomycin is an antibiotic used to treat serious bacterial infections. It's most commonly administered intravenously, typically for infections such as bacteremia, endocarditis, osteomyelitis, etc. Despite its wide-spread use and success in treating these serious infections, clinicians have a challenging job to provide the correct dosage to their patients. This is because the manner in which Vancomycin distributes through the body is complex, with factors such as body weight, muscle mass, and fat distribution all playing a role. Vancomycin also has a narrow therapeutic index. This means that small differences in dose or blood concentration can lead to therapeutic failures or adverse drug reactions and an increased risk of overdosing or underdosing.

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Automating TPN Calculation in KNIME for Quality Care

August 31, 2022 — by Courtney Ciarrocca & Dayanjan Wijesinghe

You are the clinical pharmacist in the internal medicine team at your hospital. During morning rounds, you see a new patient who was admitted that morning for an 8-day history of nausea, vomiting, abdominal pain and fever. The physician taking care of the new patient tells you they have tried to place a feeding tube in his nose but he keeps pulling it out. Until they find a diagnosis for his N/V the team wants to start a TPN and asks for your help.

Patients hospitalized for serious illnesses or injury are often unable to obtain their daily nutrition needs orally. Lengthy treatments can mean that patients with gastrointestinal absorption issues, obstructions, or persistent hemorrhages, for example, are not allowed anything by mouth for several days, and more[1].

Authors

Courtney Ciarrocca

Courtney is a PharmD Candidate at Virginia Commonwealth University, School of Pharmacy. Her initial

Dayanjan Wijesinghe

Monitor Kidney Health in KNIME

September 29, 2022 — by Malik Graves & Dayanjan Wijesinghe

Kidney health is key to our overall wellbeing. Healthcare professionals use a measurement known as the Glomerular Filtration Rate (GFR) to monitor how well our kidneys are working to clean our blood.

Glomeruli are tiny filters in our kidneys that help remove toxins from our blood. The GFR measures how much blood these filters can clean every minute. Monitoring our GFR helps doctors keep an eye out for the onset of kidney disease – the major disease of concern being Chronic Kidney Disease (CDK) – and provide the right degree of individualized treatment, ranging from advice on simple lifestyle changes through to kidney transplant or dialysis.

However it can't be measured directly. The calculation is complex, based on multiple factors like age, body size, sex, race/ethnicity, as well as the level of creatinine – a waste product – in the blood.
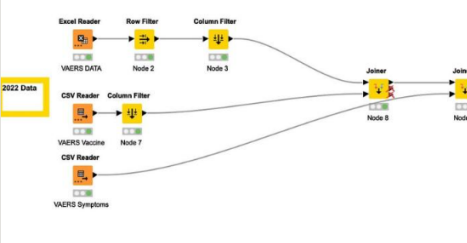
Authors

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Malik Graves is a 4th year pharmacy student at Virginia Commonwealth University. Recently he completed his
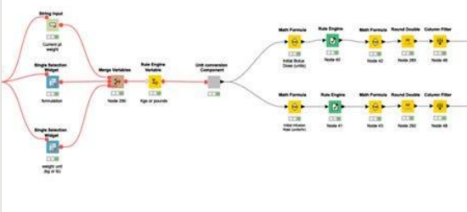
Dayanjan Wijesinghe
in

Dr. Wijesinghe is an Associate Professor at Virginia Commonwealth

Using KNIME to undertake Pharmacovigilance of Special Patient Populations

Medium

This workflow demonstrates how the code free data science platform KNIME can be harnessed for post market surveillance of vaccines.

KNIME Based Heparin Calculator for Adult General Cardiovascular and Adult and Children's Deep...

Medium

This workflow demonstrates how the code free data science platform KNIME can be used to create a heparin dosing calculator.

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Automating Pharmacokinetics Calculations in KNIME

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Automating Pharmacokinetics Calculation in KNIME | KNIME

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Fourth blog post in our series of PharmD candidates building clinically relevant digital health applications as a part of the Advanced Pharmacy Practice Elective (APPE) in Digital Health and Virginia Commonwealth University School of Pharmacy. This is the second project undertaken by Ms. Danielle Holdren, a...

Blog
Automating TPN Calculation in KNIME for Quality Care

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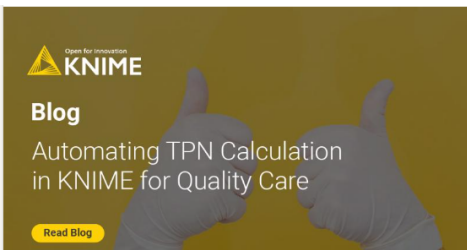
Automating TPN Calculation in KNIME for Quality Care | KNIME

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First blog post in our series of PharmD candidates building clinically relevant digital health applications as a part of the Advanced Pharmacy Practice Elective (APPE) in Digital Health and Virginia Commonwealth University School of Pharmacy. This was the project undertaken by Ms. Courtney Ciarrocca, a current P4...

Monitor Kidney Health in KNIME
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KNIME

Third blog post in our series of PharmD candidates building clinically relevant digital health applications as a part of the Advanced Pharmacy Practice Elective (APPE) in Digital Health and Virginia Commonwealth University School of Pharmacy. This was the project undertaken by Mr. Malik Graves, a current P4 from...

In 5 weeks, a healthcare student becomes health data application developer!

Danielle Holdren • 1st
Doctor of Pharmacy Candidate
3mo • 🌐

I am absolutely elated to share that upon completion of my PharmD, I will be joining the Merck translational medicine team in conjunction with the Rutgers Pharmaceutical Industry Fellowship (RPIF) Program, as an early clinical : ...see more

😍❤️ You and 202 others   20 comments • 1 repost

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Add a comment...   😊 🖼

Amir M Behdani • 1st
Pharm.D Candidate, Incoming Biomarker Development...
4mo • 🌐

🔷 Flashback to 12/13/14: As an 18-year-old, I nervously sat for my IELTS exam, on the brink of migration, filled with dreams and uncertainties about the future.
🔷 Fast forward to 12/13/23: Exactly nine years later, the circle completed in the most remarkable way – I accepted a postdoctoral fellowship in biomarker development with Novartis, in conjunction with the MCPHS Industry Fellowship Program!
Reflecting on this journey from a hopeful teenager to an ~almost~ pharmacist making this announcement feels so surreal. So grateful for my mentors who have been there with great advice and continuous encouragement every step of the way – Dayanjan Wijesinghe, Emily Peron, Kelechi (K.C.) Ogbonna, PharmD, MSHA, Michelle Marie Harrison, Lauren Pamulapati, Kevin Lan, Morgan McCluskey Wirtz, PharmD, MBA, Jumoke Shofoluwe, Annie Vo, Christine Bryant, PharmD, BCGP, Joshua Crawford, and Kyle Zacholski –

A space to call their own -Digital Health Lab

- Approximately 1200 sq ft open space
- 16 desktop computers arranged in 4 pods with latest version of KNIME installed
- 5 collaboration tables
- Couch for relaxed discussion
- Whiteboard for brainstorming
- 3D printers
- XR headsets - 10
- Arduino and Raspberry Pi
- Sensors for application development
- Cell phones for mobile application development
- Safe and inclusive space to learn DH/DTx application development for healthcare

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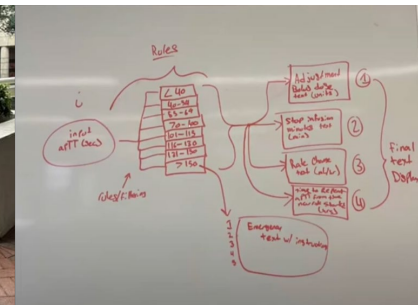
Creating opportunities for DH/DTx application development

DH/DTx Digital Badging

Keeping the cutting edge technology training REAL by validating validating through Digital Badges

Digital Health: Level 1

Issued by Virginia Commonwealth University

Earners have achieved a basic understanding of healthcare data, its challenges and solutions. They also have a basic understanding towards implementing data science approaches, healthca data analysis and utilization in order to solve healthcare challenges.

Skills

Digital Health | Healthcare Analysis | Healthcare Data | Healthcare Data Analysis

Healthcare Research | Health Data

Earning Criteria

Participate in three Pharmacists for Digital Health seminars given by industry leaders in digital health, and participate in at least one Pharmacists for Digital Health workshop. The 3 digital health seminars and the workshop consist of 6 hours total and must be completed within a 1 year period.

Type: Learning

Level: Foundational

Time: Hours

Cost: Free

Additional Details

Showing 1 - 12 of 102 listings for:
Digital health and Pharmacy in all of the United States with Job Title: **Intern Corporate Strategy**

JOB TITLE	EST. SALARY	LOCATION
Corporate Strategy Intern _Humana_	$78,000	Troy, MI
Corporate Strategy Intern _Humana_	$67,000	AZ
Corporate Strategy Intern Summer 2022 _Humana_	$72,000	Troy, MI
Corporate Strategy Intern Summer 2022 _Humana_	$64,000	Tulsa, OK
Corporate Strategy Intern Summer 2022 _Humana_	$70,000	Colorado Springs, CO
Corporate Strategy Intern Summer 2022 _Humana_	$60,000	Louisville, KY

Thank You and Happy to Take Questions