The Future of Pharmacy

How to use new technology and advancements in existing technology to grow and succeed in the 21st century of healthcare.

Technology advancements in our lifetimes

How consumers adopt new technology

Past impacts of technology on pharmacy

The Future of Pharmacy

Pharmacogenomics

- The Need
- The History
- How It Works
- Regulatory Concerns
- Current Applications
**Variances in genetic makeup**

Access to genetic information

1 in 25 American adults has access to genetic info

**Pharmacogenomics historical timeline**

- **510 BC**: Genetic differences first noticed by Pythagoras
- **1990**: Start of Human Genome Project
- **2005**: First pharmacogenetic testing for CYP2D6 and CYP2C19

**Implications of codeine metabolizers**

- **1-2%**: Ultrarapid metabolizer
- **5-10%**: Poor metabolizer

**How it works**

- Genes
- Proteins
- Enzymes
- Drugs

**3D Drug Printing**

- The Need
- The History
- How It Works
- Regulatory Concerns
- Current Applications
Need for better control and customization

15% Variation in drug dosage from the label claim considered to meet uniformity requirements

Source: http://www.pharmacopeia.cn/v29240/usp29nf24s0_c905.html

3D drug printing historical timeline

- 1981: 3D printing first used to fabricate 3D plastic models
- 2014: FabRx was founded by two professors
- 2015: Spritam (levetiracetam): the first 3D printed FDA approved drug


First 3D printed FDA approved drug

Spritam


Regulatory Concerns


3D drug printing process

3D printing of Theophylline tablet

7x speed


Tablet Recognition

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications
Pill identification calls to poison control

- 2016: 137,880 calls
- 2015: 195,955 calls
- 2014: 287,038 calls
- 2013: 408,711 calls
- 2012: 558,117 calls

9 out of 10 patients 65+ can be prone to misidentifying.

Source: https://www.tandfonline.com/doi/abs/10.1080/15563650902754877?journalCode=ictx20

Tablet recognition historical timeline

- 1920s: Supreme court ruled on Cocco-Quinine
- 1950s: Ruling on Pepto Bismol. Pink color provided therapeutic value and not protected under trade dress

3,800+ Prescription products

29,000+ Unique NDCs

Currently limited to Arizona, Idaho and Texas

Companies automate pill counting and identification

Personal Medication Assistant

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications
Need for medication management

75 million people using 3 or more drugs
38.6 million people using 5 or more drugs

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3934668/

Personal medication assistant history

- 2014: Idea for Pillo
- 2017: First shipment of Pillo product to consumers
- 2017: InPower

More than just a pill organizer

Protecting patient information

How it works

Drone Delivery

- The Need
- The History
- How It Works
- Regulatory Concerns
- Current Applications
"The Leaky Bucket"

- Out of every 100 new prescriptions, 50-70 arrive at a pharmacy.
- 46-66 are picked up by the patient.
- 25-30 are taken properly.
- 15-20 are refilled as prescribed.

Source: IMS Health Data, March 2011

Drone delivery historical timeline

- 2013: Drone delivered textbooks in Australia
- 2015: Three shipments of medical supplies in Virginia
- 2016: Medical supplies delivered from land to ship off the coast of New Jersey
  Domino’s pizza delivered in New Zealand

Source: https://www.marketwatch.com/story/the-heavy-on-hype-light-on-substance-world-of-drone-delivery-2016-12-01

First prescription delivery by drone


Taylor v FAA

Source: https://www.youtube.com/watch?v=tBZSgTCL_n0

Drone delivery trials

- Morningafter pill in Kent, England
- QuiQui of $1, 24-hour delivery

Source: https://www.youtube.com/watch?v=043Ma4jKKIM

Telepharmacy

- The Need
- The History
- How It Works
- Regulatory Concerns
- Current Applications
Need for alternative delivery

Number of Independent Rural Pharmacies (2003-2013)
924 independent rural pharmacies closed
490 rural communities lost their only pharmacy

Source: Update: Independently Owned Pharmacy Closures in Rural America, 2003-2013; RUPRI Center for Rural Health Policy Analysis, Rural Policy Brief June 2014; Fred Ullrich, BA; Keith J. Mueller, PhD

Telepharmacy historical timeline

1942 Australia’s Royal Flying Doctor Service
2001 North Dakota first state to allow
2001 Community Health Association in Spokane, WA launches program
2002 NDSU study begins
2003 Alaska Native Medical Center program
2006 U.S. Navy begins telepharmacy

North Dakota telepharmacy case study

Medication dispensing error rate for telepharmacies
<1%
Compared to a national average of ~1.7%
Result: Positive outcomes, mechanisms could be improved


Expanding regulatory environment

Telepharmacy in retail independent

How it works

1. New prescription arrives at Pharmacy A
2. Technician A fills, taking images of the process
3. Pharmacist B reviews images to verify fill is accurate
4. Patient picks up Rx at Pharmacy A and Pharmacist B counsels
Medical Marijuana

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications

Need for pharmacist prescribing

2,254,782
Est. legal medical marijuana patients in 30 approved states

States with Pharmacist dispense

- MN: 6,384 patients
- CT: 23,960 patients
- NY: 13,015 patients

Medical marijuana historical timeline

- 1970: Controlled substances act - “No accepted medical use”
- 1996: California is the first state to legalize the use of medical Marijuana
- 2018: Currently 30 states have legalized the use of medical marijuana

Drug interactions with marijuana

93 Million
Annual Atorvastatin Rx

21 Million
Annual Clopidogrel Rx

Medical Marijuana Approved

Legality concerns

Pharmacist prescribing in CT, MN, NY

- Patient diagnosed with approved medical condition by physician
- Patient consultation with RPh to create goals for therapy
- RPh determines dose & formulation
- RPh dispenses to patient
Prescribing Authority

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications

Illinois case study

- 12,500 + RPh licensed in Illinois
- Residents lack access to pharmacist-provided services
  - Chronic disease management
  - Drug therapy management
  - Preventative screenings

Source: http://www.ipha.org/assets/docs/AM17/Presentations/print%20reynoldsillinois%20pharmacy%20law%20update%2020170826.pdf

Prescribing authority historical timeline

United States
- 1960s: Clinical pharmacy in ambulatory setting
- 1980s: RPhs in federally funded primary care
- 2000s: MTM
- 2009: 37 states have language authorizing collaborative practice agreements
- 2018: Idaho

Canada
- RPh authority now involves selected medications from formularies
- No national initiative, left to provinces

Regulations vary by state

MTM impacts in Ohio

900,000 Medicaid-eligible patients

How it works

Collaborative Prescribing
- Dependent (CPAs)
- Patient specific (most restrictive)
- Population specific

Independent Prescribing
- Statewide protocol
- Unrestricted
Reimbursement of Services

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications

Costs of non-adherence

- $290 billion
  - Annually in mostly avoidable costs to treat adverse events from inappropriate medication use
- $100 billion
  - Medication non-adherence alone results in each year in excess hospitalizations.

Reimbursement historical timeline

- 1980: Pharmacists in federally funded centers are recognized as providers
- 1997: Nurse practitioners and Physician Assistants obtain provider status through the balanced budget act of 1997

Federal recognition of provider status

Current application

- CLIA Waived Test
- Albertsons in Idaho

Point of care testing
Tech-check-tech

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications

RPh and technicians to practice at top of license

Tech-check-tech historical timeline

- TCT was initially implemented for rural hospitals that could not afford pharmacists
- Now TCT has now been approved in 12 states

Tech-check-tech approved
- Yes
- No

Safety of tech-check-tech

99.45% vs 99.73%
Tech Accuracy same as pharmacist


Iowa tech-check-tech pilot study

How it works
Technician Immunizations

- The Need
- The History
- How it Works
- Regulatory Concerns
- Current Applications

RPh limited in time for clinical services

Only 40.3% of pharmacist’s time is spent on value-added tasks (Clinical and patient interactions)

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5043635/

Tech immunizations historical timeline

- 2009: All 50 states allow pharmacist to immunize (varies by state)
- 2017: Idaho is the first state to approve technicians giving immunizations
- 2017: Washington State University develops first accredited training program for technicians

Proper training ensures safety

953 vaccinations administered by techs with no adverse events


Idaho only state to allow tech immunizations

Summary

- How can your pharmacy benefit from some of the current changes in technology to increase your bottom line and stay competitive?
- What are some changes your pharmacy business can make to implement new technologies that excite you?
- How can you be a thought leader, influencing the direction and form the way pharmacies provide services?
<table>
<thead>
<tr>
<th>CE Question #1</th>
<th>CE Question #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>What year was the first time a pharmacogenomic variance between humans was recorded?</td>
<td>Artificial Intelligence exists that can recognize a tablet based on its shape and imprint through camera image recognition.</td>
</tr>
<tr>
<td>A.) 510 BC</td>
<td>A.) True</td>
</tr>
<tr>
<td>B.) 0</td>
<td>B.) False</td>
</tr>
<tr>
<td>C.) 1776</td>
<td>C.) Answering this question is a slippery slope</td>
</tr>
<tr>
<td>D.) 1979</td>
<td>D.) I can neither confirm or deny this</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CE Question #3</th>
<th>CE Question #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to IMS, what percentage of patients never pick up their prescriptions?</td>
<td>Which of the following are ways to increase pharmacist presence?</td>
</tr>
<tr>
<td>A.) 50-70</td>
<td>A.) Telepharmacy in warfarin clinics</td>
</tr>
<tr>
<td>B.) 30-50</td>
<td>B.) Telepharmacy to allow HIV medications at discharge</td>
</tr>
<tr>
<td>C.) 10-30</td>
<td>C.) Telepharmacy to allow overnight coverage at rural hospitals/clinics</td>
</tr>
<tr>
<td>D.) Trick Question. All patients pick up their medications and take them exactly as prescribed.</td>
<td>D.) All of the above</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CE Question #5</th>
<th>CE Question #6</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to the NIH, what percentage of a pharmacist’s time is spent doing non-clinical tasks.</td>
<td>In which state does a pharmacist have independent prescriptive authority?</td>
</tr>
<tr>
<td>A.) 20%</td>
<td>A.) Iowa</td>
</tr>
<tr>
<td>B.) 40%</td>
<td>B.) Ohio</td>
</tr>
<tr>
<td>C.) 60%</td>
<td>C.) Idaho</td>
</tr>
<tr>
<td>D.) 80%</td>
<td>D.) Idawahio</td>
</tr>
</tbody>
</table>
Thank you

Adam Chesler
adam.chesler@cardinalhealth.com

APPENDIX