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COVID-19 Vaccine: Updates and Role of Pharmacists

The Role of Intern Pharmacists in Implementing Innovative and Sustainable Practices to Enhance Rates of Non-influenza Immunizations

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Reporting Back on the CURES Act

As we begin to see a light at the end of the pandemic tunnel with the authorization of two COVID-19 vaccines (and more on the way), I am inspired by continued dedication of pharmacy professionals. Throughout this ordeal, you have been firm in your commitment to serving your communities. And now, as pharmacists and pharmacy technicians have been authorized to administer these vaccines in California and many other states, the immunization courses offered by CPhA are filled to capacity with pharmacy professionals eager to do their part.

We all see stories of pharmacists doing whatever they can to help. Whether it’s setting up flu shot clinics, coming out of retirement, or buying groceries for neighbors who are at higher risk, you have been unwavering in your support of your patients and your communities. In the pages of this journal, we see pharmacists and even pharmacy students and residents pushing research forward to better serve patients.

I am particularly interested in the article examining the CURES data reporting on the dispensing rates of opioids among pediatrics and young adults. The data is encouraging, and dispensing rates have declined since the requirements instituted by CURES. I had the privilege to serve on the Assembly Health committee for six years while in the CA legislature, and legislation relating to CURES came before us several times. It isn’t often that I am able to hear a report back on the results of legislation that was passed. This is a weakness in much of our law making as there is rarely a look back to see if the intentions of the legislation are fulfilled. This research reveals that while the prescription rates have declined, there is still work to be done, to identify the risk factors for continued opioid abuse in young people and that there is a benefit to policies that will target specific communities and regions where the problems are more persistent. This research and the other articles in this issue can help inform both improved health outcomes and public policy.

Thank you again for your unwavering commitment to serving your patients however you can through your practice, your community service, and your research.

Susan A. Bonilla
CEO, California Pharmacists Association
Dear Colleagues,

We have all been wishing each other ‘Happy New Year’ hoping 2021 will be a better, brighter year than 2020. Saying 2020 was memorable is understating it, it seemed like wherever you looked, there were new challenges and uncertainties. But as evolving human beings, scientists and health care providers, the progress that has been demonstrated is superhuman, with not one, but two vaccines with >94% efficacy receiving an EUA within a year! And plenty individual level stories of grit. It would be remiss of me if I didn’t say take a look at the mirror, each of us is one such example of adaptability and resilience. We will all rise from this virus and help vaccinate and build back a new level of normalcy into our lives.

As pharmacists, our roles have definitely been more noticed at the national level, from testing to vaccinating. Although this has come at a challenging time, we can use this visibility to bring attention to our capabilities in providing direct patient care, in collaborating on new practice models, in resolving issues of medication adherence; and in establishing ourselves as providers in the public’s mind.

And as we move into a new year, a redefined perspective with more diversity, inclusion and equity, across the US, let us hope this is also the year we succeed in attaining provider status with CMS.

Our current issue brings in more examples of our focus and value in various practice settings; beginning with Dr. Dang providing an outline of our roles with the vaccination process, while Dr. Nguyen and his team discuss how our intern pharmacists can help with immunizations. Dr. Frausto, Associate Editor for CPESN, and her colleagues present an insight into CPESN and what it means to community pharmacies and practice. Studies from inpatient settings on inhalers, and automated dispensing show us ways we might reduce waste and increase efficiency in our practice. Finally Dr. Phan ad his team evaluate opioid dispensing rates in our younger population.

All in all, a new year’s issue filled with pearls.

• COVID-19 Vaccine: Updates and Role of Pharmacists
• An Introduction to CPESN
• Choose Wisely: Metered Dose Inhalers Versus Nebulized Inhaled Solutions in The Inpatient Setting
• Automated Dispensing Cabinet Optimization in a Level 2 Trauma Center
• Evaluating Opioid Dispensing Rates among Pediatrics and Young Adults based on CURES Data Reporting in California from 2015-2019
• The Role of Intern Pharmacists in Implementing Innovative and Sustainable Practices to Enhance Rates of Non-influenza Immunizations

As always, the Journal and I welcome your ideas and input and of course, manuscript submissions.

Happy New Year and Happy Reading!!

Anandi V. Law, BPharm, MS, PhD, FAPhA
Editor-in-Chief

Letters to the Editor

Do you have thoughts you’d like to share about an article published in this Journal or an issue facing the profession of pharmacy? We invite you to submit a Letter to the Editor or a Commentary piece to facilitate open discussion of the profession. Visit editorialmanager.com/calpharm/default.aspx to submit your article using the Letter to the Editor/Commentary article type.
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COVID-19 Vaccine: Updates and Role of Pharmacists
Richard Dang, PharmD, APh, BCACP

Introduction
The 2019 novel coronavirus (SARS-CoV-2 or 2019-nCoV) and coronavirus disease-2019 (COVID-19) pandemic is a global health crisis. As of December 31, 2020, there are over 83.5 million cases and 1.8 million deaths globally,(1-3) and 2.2 million cases and 25,300 deaths in California.(4) The addition of a vaccine to prevent COVID-19 is an essential addition to the public health and safety toolkit alongside recommendations for physical distancing, hand hygiene, masks and face coverings, testing, tracing, quarantining or isolation, and therapeutics. There are currently two vaccines that have received emergency use authorization (EUA) in the United States to prevent COVID-19: the Pfizer-BioNTech mRNA COVID-19(5) and Moderna mRNA COVID-19 vaccines.(6) In the first 3 weeks since its authorization, the U.S. has distributed over 12.4 million and 2.7 million first doses had been administered.(6)

Pfizer-BioNTech COVID-19 Vaccine
The Pfizer-BioNTech (BNT162b2) vaccine, authorized on December 11, 2020, was reviewed and authorized or recommended by the US Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC)(8), and the Western States Scientific Safety Review Workgroup(9) for the prevention of COVID-19 in individuals 16 years and older. The Phase 3 trial for the BNT162b2 included 43,548 participants from the US, Argentina, Brazil, and South Africa.(6) BNT162b2 was found to be 95% effective in preventing COVID-19 with similar vaccine efficacy observed across subgroups defined by age, sex, race, ethnicity, baseline body-mass index, and the presence of coexisting conditions. The incidence of serious adverse events was low and the safety profile was characterized by local and systemic reactions. Following two reports of anaphylaxis in the United Kingdom, the CDC identified six cases after 272,001 doses were administered in the U.S. and continues to monitor through its surveillance programs.(6) See Table 1 for summary of vaccine characteristics, inducing information on dosing, storage, preparation, and administration.

Moderna COVID-19 Vaccine
The Moderna (mRNA-1273) vaccine, authorized on December 18, 2020, was reviewed and authorized or recommended by the FDA, CDC(10), and the Western States Scientific Safety Review Workgroup(11) for the prevention of COVID-19 in individuals 18 years and older. The Phase 3 trial for the mRNA-1273 included 30,420 participants from the US.(12) The interim efficacy analysis of BNT162b2 demonstrated vaccine efficacy of 94.5% in preventing symptomatic COVID-19 with similar vaccine efficacy observed across subgroups defined by age, sex, race, ethnicity, and occupational risk factors. The incidence of serious adverse events was low and the safety profile was characterized by local and systemic reactions. See Table 1 for summary of vaccine characteristics, inducing information on dosing, storage, preparation, and administration.

See Table 2 for list of clinical resources for both vaccines, including FDA fact sheets, CDC recommendations, and manufacturer resources.

Distribution and Allocation
Vaccine distribution and allocation is largely being overseen at the federal level with subsequent delegated responsibility to the state, local, and provider level. Both the CDC(13,14,15) and the California Department of Public Health (CDPH)(16) have established guidelines for the phased distribution of COVID-19 vaccine to prioritized groups. The CDC and CDPH have identified populations for Phase 1A, 1B, and 1C while the remaining phases are still to be determined. See Table 3 for the list of phases and tiers of prioritized and sub-prioritized groups.

The current phase and tier of allocation may vary on the local level. Generally, most California counties are currently in Phase 1A, tier 1 or 2. Pharmacists are playing a major role in the implementation and distribution of the COVID-19 vaccine. Pharmacists can order and administer the COVID-19 vaccine and intern pharmacists and pharmacy technicians can administer the COVID-19 vaccine.(17,18,19) Pharmacies can receive vaccine allocation through three methods: participation in the Federal Pharmacy Partnership for Long-Term Care (LTC) Program(20,21), participation in Federal Retail Pharmacy Partnership(22,23), or invitation from the local health department (LHD). For more information about provider enrollment through the local jurisdictions, visit the COVIDReadi Platform(24) and contact your LHD.(25)

The current status of each program may vary on the local level. Generally, the federal LTC program has been activated and the federal retail and invitations to pharmacies from LHD have not yet been activated in California.

Conclusion
The distribution and allocation of the COVID-19 vaccine are still in its initial stages. As vaccine supply increases, the remainder of the plans will be activated and pharmacies, pharmacists, pharmacy technicians, and intern pharmacists will play a crucial role in ensuring quick and equitable access to nearly 40 million Californians across all 58 counties.

About the Author
Richard Dang, PharmD, APh, BCACP, is an Assistant Professor of Clinical Pharmacy and Program Director of the PGY1 Community-Based Pharmacy Residency Program at the University of Southern California (USC) School of Pharmacy, and is President-Elect for the California Pharmacists Association (CPHA). He is Chair of the CPHA COVID-19 Taskforce and is a member of the USC COVID-19 vaccine planning steering committee, California State Testing Taskforce, CDPH Immunization Branch Pharmacy Taskforce, and Adult Workgroup of the Immunization Action Coalition of Los Angeles (ICLAC).
Table 1. Comparison of COVID-19 Vaccines

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-BioNTech&lt;sup&gt;28&lt;/sup&gt;</th>
<th>Moderna&lt;sup&gt;27&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>mRNA</td>
<td>mRNA</td>
</tr>
<tr>
<td>Vaccine Efficacy</td>
<td>95%</td>
<td>94.5%</td>
</tr>
<tr>
<td>Doses per Vial</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Dose and Route</td>
<td>0.3 mL, IM</td>
<td>0.5 mL, IM</td>
</tr>
<tr>
<td>Dosing Schedule</td>
<td>2 doses, 21 days apart</td>
<td>2 doses, 26 days apart</td>
</tr>
<tr>
<td>Authorized Age</td>
<td>16 years and older</td>
<td>18 years and older</td>
</tr>
<tr>
<td>Dilution</td>
<td>Dilute with 0.9% sodium chloride</td>
<td>No dilution needed</td>
</tr>
</tbody>
</table>

**Storage and Stability**

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-BioNTech&lt;sup&gt;28&lt;/sup&gt;</th>
<th>Moderna&lt;sup&gt;27&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULT: -60.0°C to -80.0°C</td>
<td>6 months</td>
<td>N/A</td>
</tr>
<tr>
<td>Freezer: -25°C to -15°C</td>
<td>N/A</td>
<td>Until expiration date</td>
</tr>
<tr>
<td>Fridge: 2°C to 8°C</td>
<td>5 days</td>
<td>30 days</td>
</tr>
<tr>
<td>RT: 8°C to 25°C</td>
<td>Undiluted: 2 hours Diluted: 6 hours</td>
<td>Unpunctured: 12 hours Punctured: 6 hours</td>
</tr>
</tbody>
</table>

**Thawing Times**

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-BioNTech&lt;sup&gt;28&lt;/sup&gt;</th>
<th>Moderna&lt;sup&gt;27&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fridge: 3 hours RT: 30 min</td>
<td>Pain at the injection site (82.1%), fatigue (45.5%), headache (45.7%), muscle pain (38.3%), chills (31.9%), joint pain (23.6%), fever (14.2%), injection site swelling (10.5%), injection site redness (9.5%), nausea (1.1%), malaise (0.5%), and lymphadenopathy (0.3%)</td>
<td>Pain at the injection site (82.1%), fatigue (45.5%), headache (45.7%), muscle pain (38.3%), chills (31.9%), joint pain (23.6%), fever (14.2%), injection site swelling (10.5%), injection site redness (9.5%), nausea (1.1%), malaise (0.5%), and lymphadenopathy (0.3%)</td>
</tr>
</tbody>
</table>

**Ingredients**

<table>
<thead>
<tr>
<th></th>
<th>Pfizer-BioNTech&lt;sup&gt;28&lt;/sup&gt;</th>
<th>Moderna&lt;sup&gt;27&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 mcg of a nucleoside-modified messenger RNA (modRNA), lipids, 2([polyethylene glycol]-2000]-N,N-ditetradecylacetamide, phosphatidylcholine, cholesterol, potassium chloride, monobasic potassium phosphate, sodium chloride, dibasic sodium phosphate dihydrate, and sucrose</td>
<td>100 mcg of nucleoside modified messenger RNA (mRNA) e, lipids, polyethylene glycol [PEG] 2000 dimyristoyl glycerol (DMG), cholesterol, SM-102, tromethamine, hydrochloride, acetic acid, sodium acetate, sucrose</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ULT - ultra low temperature; RT - room temperature

---

Table 2. Resources

**CDPH Resources**

| Training: [https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/COVID-19VaccineTraining.aspx](https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/COVID-19VaccineTraining.aspx) |

| Vaccinate All 58 Program: [https://covid19.ca.gov/vaccines/](https://covid19.ca.gov/vaccines/) |

**FDA Resources**


**CDC Resources**


| General Information: [https://www.cdc.gov/vaccines/covid-19/index.html](https://www.cdc.gov/vaccines/covid-19/index.html) |


**Manufacturer Resources**

| Pfizer/BioNTech: [https://www.cvdvaccine-us.com/](https://www.cvdvaccine-us.com/) |

| Moderna: [https://www.modernatx.com/covid19vaccine-eua/providers/](https://www.modernatx.com/covid19vaccine-eua/providers/) |
Table 3. CDPH Vaccine Prioritization[14,15,28]

| Phase 1A | The tiers and categories in each tier are presented in ranked order. Persons immunizing the prioritized populations in a tier should be offered immunization during or before the same tier they are providing vaccine services.
| Tier 1 | • Health Care Workers at Acute Care Hospitals, Psychiatric and Correctional Facility Hospitals
| Tier 2 | • Skilled Nursing Facility Health Care Workers and Residents
| Tier 3 | • EMTs and Paramedics
| Tier 1B | • Other Long-Term Care Facility Health Care Workers and Residents
| Tier 1C | • Special Needs Group Living Health Care Staff
| Tier 2 | • Dialysis and Infusion Centers
| Tier 3 | • Regional Centers

| Phase 2 | To be determined
| • Persons 65-74 years old
| • Persons 16-64 years old with high-risk medical conditions
| Other Essential Workers:
| • Transportation and logistics
| • Food Service
| • Shelter & Housing (construction)
| • Finance (e.g., bank tellers)
| • IT & Communication
| • Energy
| • Media
| • Legal
| • Public Safety (Engineers)
| • Water & Wastewater

| Phase 3 | To be determined

References
1. https://coronavirus.jhu.edu/map.html
6. https://www.cdc.gov/mmwr/volumes/69/wr/mm6950e2.htm?s_cid=mm6950e2_w
10. https://www.cdc.gov/mmwr/volumes/69/wr/mm6950e2.htm?s_cid=mm6950e2_w
12. https://www.fda.gov/media/144434/download
14. https://www.cdc.gov/mmwr/volumes/69/wr/mm6949e1.htm
15. https://www.cdc.gov/mmwr/volumes/69/wr/mm695152e2.htm?s_cid=mm695152e2_w
25. https://www.cdph.ca.gov/Programs/OID/DCDC/Pages/Immunization/Local-Health-Department.aspx
26. https://www.fda.gov/media/144413/download
27. https://www.fda.gov/media/144637/download
An Introduction to CPESN

Kerry Kribbs, BBA, MHA; Kerri Okamura, RPh; Jay Williams; Sonya Frausto, PharmD, MAG, FCPhA, FCCS, FACC

Have you ever wondered which pharmacy networks are the largest? CVS and Walgreens might be at the top of your list, but there is a relatively unknown network of over 3,000 community-based pharmacies that have quickly moved into the top five. That is over 3000 local community pharmacies across that nation in a newly created network called CPESN® USA. CPESN® USA is not an ordinary network but rather the country’s first and only Accountable Pharmacy Organization – a group of forward-thinking community pharmacy owners focused on both providing critical clinical services to the patients they serve and on working directly with payers who value the benefits of a patient-focused approach. In other words, CPESN® USA is focused on creating opportunities to provide value-based care in community pharmacies.

This original network was able to create local opportunities where pharmacies/pharmacists would contract with employer groups and bill for clinical services rendered under the medical benefits of health plans. This is revolutionary as most reimbursement for pharmacies is tied to a product, despite the many other clinical tasks that are performed by pharmacists including but not limited to extensive counseling, blood pressure screenings, monitoring of lab values and ensuring patient adherence to medications with a variety of adherence tools. However, pharmacists are typically not able to charge pharmacy benefit managers for these services and although medication therapy management programs have propelled pharmacists to showcase our significant impact on managing chronic disease the reimbursement is low and related to dispensing adherence not outcomes. Those are the key tenets of every new CPESN network in operation today or every new CPESN network going forward.

With this shared mindset, pharmacists across the nation recognize the role local, community-based pharmacies have in keeping patients healthy. This has led to an explosion of CPESN networks being established, the creation of minimum service standards that are shared across the networks, and importantly, education, training, and best practices sharing centered around working directly with health plans and other medical side payers who are focused on improving the overall health of their patients (members).

As we go into 2021, CPESN® USA is positioned to excel in three areas.

First, CPESN® USA is a federal vaccine partner helping independent pharmacies prepare to deliver the COVID 19 vaccinations to their communities. They want to help getting America back to normal, especially in the underserved rural and inner city areas where CPESN pharmacies have a strong presence.

Second, CPESN® USA has educated and trained pharmacists in each network to have the skill set to approach health plans and other medical side payer to confidently share the CPESN model and its documented success in improving outcomes and surpassing performance metrics.

Third, CPESN® USA is actively recruiting new pharmacies, partners, and payors to expand the reach local networks have to serve communities in need.

If you are interested in learning more about CPESN networks or how to join your local a network in your area, email info@cpesn.com or visit cpesn.com/pharmacies to gain more information.

About the Authors

Kerry Kribbs, BBA, MHA, is a Network Liaison with CPESN USA.

Kerri Okamura, RPh, is a Network Liaison with CPESN as well as a Luminary for CPESN Hawaii. She is also Director of Pharmacy for KTA Super Stores who have been members of CPESN since 2018.

Jay Williams has been working directly with independent, community-based pharmacy owners for more than twenty years. As the Director of Marketing & Communications for CPESN USA, Jay continues that journey. Prior to joining CPESN USA, Jay served as the VP of Marketing for PrescribeWellness, VP of Marketing for Cardinal Health, and Director of Marketing for AmerisourceBergen. In each of these leadership positions, he was responsible for the marketing strategy and communications deliverables impacting community-based pharmacies.

Sonya Frausto, PharmD, MAG, FCPhA, FCCS, FACC, is the CPESN CA Network Facilitator, Flip the Pharmacy Coach, and owns Ten Acres Pharmacy. Dr. Frausto is the CPESN Editor for the Journal of Contemporary Pharmacy Practice.
Choose Wisely: Metered Dose Inhalers Versus Nebulized Inhaled Solutions in The Inpatient Setting

Meera K. Alshamali, PharmD; Robin S. Lee, APh, PharmD; Alice K. Chang, PharmD; Johnny Wong, PharmD

Abstract

Background
Healthcare expenditures continue to rise, and hospitalization costs remain the driving factor for nationally increasing health expenditures.(1,2) Affordability initiatives targeted at minimizing inpatient drug spending and medication waste are vital. Metered-dose inhalers (MDIs) impose high potential for medication waste as their bulk nature provides a day supply that far exceeds average hospitalization length of stay.(3,4) Kaiser Permanente Baldwin Park Medical Center inpatient pharmacy adopted a cost saving initiative aimed at converting the commonly prescribed ipratropium MDI to its equivalent nebulized solution.

Methods
This was a retrospective medication use evaluation (MUE), assessing the overall drug cost impact of converting patients from ipratropium MDI to ipratropium nebulized solution. The study period consisted of two phases: the pre-implementation phase from 11/1/2017 to 09/30/2018, and the post-implementation phase from 11/01/2018 to 09/30/2019. The study population consisted of patients admitted to the Critical Care Unit (CCU) and Step-Down Unit (SDU), who were prescribed an ipratropium MDI or ipratropium nebulized solution. Patients who were under the age of 18 years old were excluded. The primary outcome was to analyze the drug cost savings of prescribing nebulized solutions over MDIs in the inpatient setting. The secondary outcome was to assess overall compliance with the conversion protocol.

Results
Ipratropium MDI administrations declined by 91% (from 3,751 to 336) during the post-implementation phase. An estimated drug cost savings of $68,700 occurred by converting the ipratropium MDIs to ipratropium nebulized solution.

Conclusion
This conversion protocol was successful at reducing MDI waste and attaining substantial drug cost savings at our medical center over a period of 1 year since implementation.

Key Words
delivery systems and devices, metered-dose inhalers (MDIs), nebulized solutions, pharmacoeconomics, medication use evaluation (MUE)

Background
In 2018, Kaiser Permanente regional pharmacy team explored an initiative targeting Metered-Dose Inhalers (MDIs) due to their high potential for incurring medication waste. MDIs are bulk items that provide an average of a 30-day supply of medication.
were included during the pre-implementation phase, while 267 patients were included during the post-implementation phase (Table 1).

**Study Outcomes**
The primary outcome of this MUE was to analyze the drug cost savings of prescribing nebulized solutions over MDIs in the inpatient setting. The electronic health record was utilized to access medication administration data during the pre and post implementation phases of this evaluation to estimate total drug costs. For patients with an active order for ipratropium MDI, we accounted for one inhaler dispense per hospital stay. For patients started on or converted to ipratropium nebulized solutions, each nebulized solution administration was collected to calculate the total drug cost of nebulized solution use during both pre-implementation and post-implementation.

The secondary outcome was to assess the overall compliance with the conversion protocol since implementation. Patients who ordered an ipratropium MDI during the post-implementation phase of the study were evaluated for lack of conversion reasons by conducting detailed chart reviews.

**Statistical Analysis**
Discrete variables were expressed as counts (percentages) and continuous variables as means. The total costs of each medication administered was added for each phase of the study. The overall drug costs were calculated and then extrapolated to a one year period. Descriptive analysis was utilized to compare the overall drug costs of the two phases in this study.

**Results**

**Primary Outcome**
The primary outcome focused on analyzing the cost savings attained by converting patients from MDIs to nebulized solutions in the inpatient setting. To do so, we calculated the total number of administrations of ipratropium MDI and ipratropium nebulized solution during each phase of the study and compared them.

During the pre-implementation phase, a total of 3751 inhalations of the ipratropium MDI were administered in the CCU and SDU. Administrations declined to a total of 336 inhalations during the post-implementation period (Figure 1A), resulting in a 91% decrease in ipratropium MDI administrations.

The number of ipratropium nebulized solution administrations increased from 380 inhalations during the pre-implementation phase to 3092 inhalations during the post-implementation phase (Figure 1B). This accounts for a 714% increase in utilization of the nebulized solution.

The total number of administrations of each medication was utilized to estimate total drug costs. The 2018 average wholesaler price (AWP) of each medication was utilized for cost calculations. Costs were extrapolated to a one-year period to give a better picture of annual drug cost savings. The estimated drug cost savings that occurred by substituting MDIs to nebulized solutions during post-implementation was approximately $68,700 (Table 2).

**Sub-Analysis**
A sub-analysis of ipratropium MDI utilization hospital wide, outside of the CCU and SDU was conducted. There is a potential for an additional $17,300 in drug cost savings if the conversion protocol was carried out hospital wide (Table 3).

**Secondary Outcomes**
The secondary outcome was to assess the overall compliance with the conversion protocol in the CCU and SDU since implementation. A total of 34 patients were not converted to ipratropium nebulized solution during the post-implementation phase. A report of average ipratropium MDI administrations per day over a three-month period pre-implementation (12/1/2017 through 2/28/2018) was obtained and compared to the same time period post-implementation (12/1/2019 through 2/29/2020). Average MDI administrations declined from 18/day to 1.2/day during post-implementation.

**Discussion**
Our conversion focused on the ipratropium MDI due to its high utilization rate for COPD patients admitted to the CCU and SDU at our medical center. This costly MDI does not have an institutional size package and its use results in an estimated 85% medication waste at point of discharge.[3,5] This conversion protocol led to a 91% decrease in ipratropium MDI administrations during post-implementation. Only 34 patients were not converted post-implementation to ipratropium nebulized solution due to unclear reasons and lack of documentation.

Despite having some challenges, through interdisciplinary collaboration, our conversion protocol was successful at obtaining an estimated $68,700 in drug cost savings over a one-year period. Since the conversion protocol was limited to the CCU and SDU, a sub-analysis of ipratropium MDI utilization hospital wide was conducted. Utilization of the ipratropium MDI outside of the CCU and SDU was minimal, with 70% of ipratropium MDI administrations occurring in these two units. An estimated additional drug cost savings of $17,300 could occur if this conversion protocol was carried out hospital wide.

Healthcare costs such as RCP labor costs and costs of respiratory therapy equipment’s were not evaluated in this study. Future direction includes evaluating these costs and presenting the sub-analysis findings to the respiratory therapy department in order to drive agreement for implementing a hospital wide therapeutic substitution.

**Limitations**
A complete chart review of each patient included in our evaluation was not feasible due to time constraints, therefore, an accurate count of MDI dispenses was lacking.

---

Table 1. Study population

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study period</td>
<td>November 1, 2017 – September 30, 2018</td>
<td>November 1, 2018 – September 30, 2019</td>
</tr>
<tr>
<td>Ipratropium MDI</td>
<td>n=169</td>
<td>n=34</td>
</tr>
<tr>
<td>Ipratropium nebulized</td>
<td>n=47</td>
<td>n=233</td>
</tr>
<tr>
<td>Number of patients included*</td>
<td>N=216</td>
<td>N=267</td>
</tr>
</tbody>
</table>
and an estimation of one MDI per patient, per admission was assumed. Additionally, drug costs are pure estimates based on the 2018 AWP price of each medication.

Conclusion

This interdisciplinary RCP and physician led conversion protocol was successful at reducing MDI waste and attaining an estimated $68,700 in drug cost savings over a period of one year since implementation. Sub-analysis of MDI utilization outside of the CCU and SDU highlighted an opportunity for an additional $17,300 in drug cost savings if the conversion was carried out to other hospital units. Our study showed that effective interprofessional collaboration can lead to organizational cost savings in the inpatient setting.

About the Authors

Meera K. Alshamali, PharmD, is an inpatient pharmacist at Hoag Hospital in Newport Beach. Dr. Alshamali completed her PGY-1 pharmacy residency at Kaiser Permanente Baldwin Park Medical Center. Dr. Alshamali has worked on various inpatient research projects throughout her career. Dr. Alshamali has no conflicts of interest to report.

Robin S. Lee, PharmD, APh, CDE, is an ambulatory care pharmacy supervisor and PGY-1 residency coordinator at Kaiser Permanente Baldwin Park Medical Center. Dr. Lee has over 20 years of experience with residents’ research projects in various fields within pharmacy. Dr. Lee has no conflicts of interest to report.

Alice K. Chang, PharmD, is an Inpatient Pharmacy Director at Kaiser Permanente at Baldwin Park. She has been the primary preceptor for the acute care experience of the PGY-1 residency at Baldwin Park for the last 22 years. Dr. Chang holds leadership role on the Pharmacy & Therapeutics Committee, the Medication Safety Committee and the Antimicrobial Stewardship Subcommittee at the medical center. Dr. Chang has no conflicts of interest to report.

Johnny Wong, PharmD, is an Inpatient Pharmacy Supervisor at Kaiser Permanente Baldwin Park Medical Center. Dr. Wong

Table 2. Breakdown of drug costs during each phase of the MUE and estimated cost savings

<table>
<thead>
<tr>
<th>Medication</th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipratropium MDI</td>
<td>$63,430</td>
<td>$16,790</td>
</tr>
<tr>
<td>ipratropium nebulized solution</td>
<td>$500</td>
<td>$4,110</td>
</tr>
<tr>
<td>Total Adjusted Cost*</td>
<td>$95,568</td>
<td>$22,800</td>
</tr>
<tr>
<td>Estimated Drug Cost Savings</td>
<td>~$68,700</td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted cost based on AWP and extrapolated for one year

Table 3. MDI utilization outside of the CCU and SDU and potential cost savings

<table>
<thead>
<tr>
<th>Hospital-wide MDI Use</th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
<th>Potential Drug Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipratropium MDI</td>
<td>39</td>
<td>35</td>
<td>~$17,300</td>
</tr>
</tbody>
</table>

Table 4. Comparison of MDI administration during a 3-month period prior to and post conversion

<table>
<thead>
<tr>
<th>Pre-Implementation (Data for 12/1/17 to 2/28/18)</th>
<th>Post-Implementation (Data for 12/1/19 to 2/19/20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average # of ipratropium MDI administrations per day</td>
<td>18.0</td>
</tr>
</tbody>
</table>

Figure 1. Sum of administration of each medication during pre- and post-conversion implementation. The number of ipratropium MDI administrations declined by 91% during post-implementation (A), while ipratropium nebulized solution use increased by 714% during post implementation (B).
has been coordinating the acute care learning experience of the PYG-1 residency for the last 6 years. Dr. Wong has no conflicts of interest to report.

References


Automated Dispensing Cabinet Optimization in a Level 2 Trauma Center

Tony Vu, PharmD; Yifan She, PharmD

Abstract

Introduction
Opportunities have been identified regarding timely delivery of medications due to lack of ADC inventory related to stock outs or other variances in pharmacy workflow (i.e. compounding and distribution times). These opportunities for improvement impact patient care and result in both nursing and pharmacy staff frustration. Additionally, there are significant costs associated with unused medications stored in ADCs, taking up valuable real estate that would otherwise house more opportune inventory. This situation has created a need for more efficient management of the ADC inventory. Currently, research in the topic area is sparse. We hypothesize that the systematic management and oversight of ADC inventory will demonstrate a significant improvement in key performance indicators and provide insight to the current gaps in knowledge.

Methods
This study will be a continuous quality improvement project with a combination of retrospective data review and prospective optimization interventions of automated dispensing cabinets (Pyxis®). Interventions include review and adjustment of ADC par levels, removal of unused/ stagnate medications, standardization of stock, and continual review of ADC inventory turns and associated optimization opportunities. The primary outcomes are the change in vend/fill ratio from baseline, change in medication stockout percentage from baseline.

Results
There was no significant difference in vend/fill ratio after the optimization phase compared with baseline [Difference 0.13 (11.56 ± 6.1 vs. 11.43 ± 5.41) respectively, (p=0.84)]. Medication stockout percentage was also found to be similar with baseline [Difference -0.05 (0.71% ± 0.12 vs. 0.76% ± 0.08) respectively, (p=0.37)]. For secondary outcomes, the change in blind stockout percentage from baseline was -0.04 (0.13 ± 0.02 vs. 0.17 ± 0.02, (p=0.004)) and the change in medications dispensed per day from baseline was 317 [2656 ± 143 vs. 2339 ± 200, (p=0.0002)].

Conclusion
Optimization of automated dispensing cabinets yielded marginal improvements in vend/fill ratio and stockout percentage and significantly improved overall efficiency through an increase in the number of medications stocked in ADCs and number of medications dispensed per day from ADCs. Evaluation of more clinically significant performance indicators may better characterize the benefits from the optimization process.

Introduction
Automated dispensing cabinets (ADC) are a common means for medication distribution in modern day hospitals. ADCs have improved overall efficiency in the medication use process by storing medications directly on the patient care unit, allowing for timely medication procurement and administration. While the benefits of ADCs are widely recognized, they are not without their shortcomings. Opportunities have been identified regarding timely delivery of medications due to lack of ADC inventory related to stock outs or other variances in pharmacy workflow (i.e. compounding and distribution times) at Kaiser Permanente Vacaville Medical Center. These opportunities for improvement impact patient care and result in increases of both nursing and pharmacy staff frustration. Additionally, there are significant costs associated with unused medications stored in ADCs, taking up valuable real estate that would otherwise house more opportune inventory. This situation has created a need for more efficient management of the ADC inventory.

Currently, research in the topic area is sparse. However, two studies provide insight into the potential benefits from optimization of ADCs. A retrospective study by Lupi et al. 2019, looked at optimization of 65 ADCs at a large tertiary medical center. Through management of ADC par levels, the authors saw a reduction in the amount of medications dispensed manually from the central pharmacy, a decrease in the frequency of medication stockouts on the patient care units, and were able to increase overall cabinet inventory while decreasing cost. Major limitations include exclusion of ADCs in the emergency department, post-anesthesia care units, and procedural areas; to note, ADC optimization occurred within a short time frame of an 8-week period. The second study by O’Neil et al. 2016, was a small prospective study that yielded modest improvements in vend/fill ratio but performed optimization on only eight nonprofiled ADCs over a 6-month period.

This study aims to determine the feasibility and potential benefits associated with improving ADC management through improved inventory oversight and generalizability by providing a longer period of optimization of ADCs in more patient care areas. We hypothesize that the systematic management and oversight of ADC inventory will demonstrate a significant improvement in key performance indicators and provide insight to the current gaps in knowledge.

Methodology
Study Design
This study will be a continuous quality improvement project with a combination of retrospective data review and will include prospective optimization intervention on automated dispensing cabinets (Pyxis®) at Kaiser Permanente Vacaville Medical Center from March 31, 2019 to January 31, 2020.
Kaiser Permanente Vacaville is a 152-bed level 2 trauma center located in Vacaville, California. The medical center has approximately 47 automated dispensing cabinets (Pyxis®). For the purposes of this study, ADC optimization was defined as the manipulation of inventory stock and stock levels within the ADC to improve operational efficiency related to the medication distribution and use process. Optimization interventions involved: 1) monthly review and adjustment of ADC par levels to decrease refills and inventory stockouts; 2) replacement of unused/stagnant medications with more opportune medications; 3) standardization of stock defined as mirroring select medications in ADCs on the same floor; and 4) continual review of ADC inventory turns and associated optimization opportunities. These procedures to be conducted are part of standard pharmacy workflow. Study objectives will be measured and assessed on a monthly basis. The study was determined to be exempt from institutional board review. See terminology in Table 1 for more information.

**Study Population**

Study population will include the automated dispensing cabinets (Pyxis®) at Kaiser Permanente Vacaville Medical Center. ADCs that will be excluded are cabinets within the central pharmacy or not linked to a patient profile.

**Study Endpoints**

The primary outcomes are the change in vend/fill ratio from baseline and change in medication stockout percentage from baseline. Baseline period was defined as the period 3 months prior to optimization (January 1, 2019 to March 30, 2019). We will also review outcomes to include a sample of medication costs as defined by WAC pricing from RED BOOK; change in medication blind stockouts percentage from baseline; change in number of medications dispensed per day; and the number of expired medications removed during the study period.

**Data Collection and Analysis**

Sources of data and data to be collected include: Kaiser Permanente Health Connect (for medications not dispensed by ADC and filled in central pharmacy), BD Knowledge Portal® (for stockout percentage, blind stockout percentage, number of medications dispensed per day, number of expired medications removed, vend/fill ratio), Permanente Online Interactive Network of Tools (POINT®) (for vend/fill ratio), stockout percentage and missing medication data for med surge floors and ICU, and BD Enterprise Server (ES) Portal® (for PAR levels, current inventory and location stocked). All information is to be extracted electronically from the above data sources without using a data collection sheet. Data is then converted into a Microsoft Excel® file to be formatted and filtered to display the information of interest as stated above.

Data will subsequently be analyzed via manual review (format of data described above). Primary and secondary outcomes will be compared using paired t-test for continuous data. Two-sided statistical power test was calculated using alpha=0.05. A p-value less than 0.05 was determined to be statistically significant.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Comments/Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vends</td>
<td>Number of medications dispensed from a pocket</td>
<td>Measure of medication utilization</td>
</tr>
<tr>
<td>Refill or fill</td>
<td>Replenishment of ADC medications that were critically low or stocked out</td>
<td>Goal is to decrease this measure.</td>
</tr>
<tr>
<td>Vend/fill ration</td>
<td>A measure of medication use efficiency, similar to “inventory turns”. Generally, aim between 10-12 but dependent on oper. need.</td>
<td>( \frac{# \text{ of } \text{vend} - # \text{ of } \text{returns}}{# \text{ of } \text{refills}} )</td>
</tr>
<tr>
<td>Stockout percentage</td>
<td>Percentage of times a medication pocket has a count of zero. Prompts a refill to pharmacy</td>
<td>( \frac{# \text{ of } \text{stockouts}}{# \text{ of } \text{vends}} )</td>
</tr>
<tr>
<td>Blind stockout percentage</td>
<td>Percentage of inventory reaching a physical quantity of zero in pocket while a discrepancy in count exists in the ADC system. This type of stock-out would not prompt a refill.</td>
<td>( \frac{# \text{ of } \text{blind stockouts}}{# \text{ of } \text{vends}} )</td>
</tr>
<tr>
<td>Expired medication</td>
<td>Medication that has reached the expiration date. Outdate 2 months from expiration date</td>
<td>Goal is to decrease this measure</td>
</tr>
<tr>
<td>Unused/Stagnant medication</td>
<td>Medications with no dispenses from pocket for greater than 90 days</td>
<td>Emergency/rescue medications (i.e., naloxone, flumazenil, etc.) are excluded</td>
</tr>
<tr>
<td>PAR level</td>
<td>Minimum and maximum quantity limits set within the ADC</td>
<td>Desired on-hand inventory levels</td>
</tr>
</tbody>
</table>
Results

A total of 47 automated dispensing cabinets (ADCs) met inclusion criteria and 21 ADCs were excluded leaving 26 ADCs for the study population. There was no significant difference found in the vend/fill ratio after the optimization phase compared with baseline [Difference 0.13 (11.56 ± 6.1 vs. 11.43 ± 5.41) respectively, (p=0.84)] (figure 1). Medication stockout percentage was also found to be similar with baseline [Difference -0.05 (0.71% ± 0.12 vs. 0.76% ± 0.08) respectively, (p=0.37)] (figure 2).

For secondary outcomes, the change in blind stockout percentage from baseline was -0.04 [0.13 ± 0.02 vs. 0.17 ± 0.02, (p=0.004)] (figure 3) and the change in number of medications dispensed per day from baseline was 317 [2656 ± 143 vs. 2339 ± 200, (p=0.0002)] (figure 4). The number of expired medications removed (through the outdating process) during the optimization period totaled 3590 medications with an average of 359 medications removed monthly. 428 medications (total quantity of 14,493) were determined to be stagnant medications, unloaded from the ADCs and replaced with more frequently used medications. From the list of stagnant medications, a sample of medication costs were calculated totaling $105,240.
Discussion

From this study, there was marginal difference seen in the primary performance indicators of vend/fill ratio and stockout percentage when compared with baseline after 10 months of optimization of automated dispensing cabinets. However, there was a significant difference found for blind stockout percentage and number of medications dispensed per day compared with baseline. From these results, we can see that with optimization there was more efficient use of pocket space. The replacement of stagnant medications with more frequently used medications caused a significant increase in the amount of medications being dispensed per day. However, this may have increased the number of refills as well, potentially explaining why there was no significant change in vend/fill ratio based on the equation:

\[ VR = \frac{\text{# of vends} \cdot \text{# of returns}}{\text{# of refills}} \]

So even though there were more medications being dispensed it was negated by the proportional increase in number of refills. We observed a significant increase in the number of refills compared to baseline strengthening this argument [Difference 30.42 (213.04 ± 157 vs. 183.62 ± 131, respectively; p= 0.0001)].

From the list of stagnant medications, we calculated a sample cost of over $100,000. This number represents the potential cost avoidance associated with the optimization process. Had the optimization process not occurred, these stagnant medications would potentially remain in the pockets until they expired.

While there was not a significant difference found in the primary performance indicators, the optimization process yielded benefit in outcomes that were not measured. During the optimization period, Kaiser Permanente Vacaville Inpatient pharmacy deployed a vial adaptor initiative. The goal of this initiative was to decrease the amount of intravenous
(IV) compounding required. Nursing was educated on how to assemble and reconstitute the IV medication themselves by connecting a vial of medication to the appropriate bag of fluid through an add-ease connector (vial adapter). For this initiative to be viable, vials of the IV medication had to be loaded into the ADCs on each floor. With optimization, more pocket space was made available by the unloading of stagnant medications and reorganization of other medications. This allowed for the loading of medications such as the add-ease related IV medications. With this initiative there was a decrease in turnaround time from order to medication administration by ~15 minutes seen in the ED.

Limitations included lack of physical space, a high baseline vend/fill ratio, and relatively small sample size. It was realized early on that physical space limited the optimization process. While there was an increase in useable pockets for more medications, bulkier items such as IV premixes, oral liquids and certain injectables (i.e. enoxaparin) had physical limitations in the cubies. Thus, there was not enough space to expand the inventory of those bulkier items. The lack of towers and only having one main and one auxiliary cabinet per med room at our site prevented the optimization of such larger items as well. Secondly, the vend/fill ratio started off high at 11.43 at baseline. General goal to aim during optimization for the vend/fill ratio is between 10-12. With a high baseline vend/fill ratio, there is less opportunities for improving efficiency of medication utilization. Coupled with the increase in refills that neutralized the gains from the increased medication dispensing, there was little room for improving the vend/fill ratio. Lastly, due to the size of the medical center, the number of ADCs included were lower than expected after applying the exclusion criteria. Compared to other studies mentioned, the sample size of this study is small to moderate size.\textsuperscript{2,3}

Overall the optimization process is very feasible requiring only one to two people for four hours once a week to perform the required optimization interventions for a medical center with 40-50 ADCs. This means that pharmacy technicians can easily allocate time once a week or incorporate the optimization process into the regular pharmacy workflow. A caveat is the initial process of unloading and/or loading of medications, and mirroring of ADCs is a time-consuming and laborious process, which may require more than four hours a week to perform in a timely manner.

Potential future improvements to the optimization process identified are the evaluation of other performance indicators with more tangible outcomes and the procurement of towers. Tangible outcomes such as the decrease in medication turnaround time, or nursing and/or pharmacy staff satisfaction may better quantify the benefits of the optimization process. Also, procurement of towers will expand the physical space available in the ADCs removing that limitation at Kaiser Permanente Vacaville.

Conclusion

Optimization of automated dispensing cabinets at Kaiser Permanente Vacaville medical center yielded marginal improvements in vend/fill ratio and stockout percentage and significantly improved overall efficiency through an increase in the number of medications stocked in ADCs and number of medications dispensed per day from ADCs. Evaluation of more clinically significant performance indicators may better characterize the benefits from the optimization process.

### References


### About the Authors

Tony Vu, PharmD, is an ambulatory care pharmacist currently at Kaiser Permanente Modesto. He graduated from Touro University California College of Pharmacy in 2019 and completed his PGY-1 pharmacy residency at Kaiser Permanente Napa –Solano in 2020. Dr. Vu conducted his research during his PGY-1 pharmacy residency under the mentorship of Dr. Yifan She. Dr. Vu has no conflicts of interest to report.

Yifan She, PharmD, is the inpatient pharmacy director currently at Kaiser Permanente Vacaville Medical Center. He graduated from the University of California School of Pharmacy in 2015. Dr. She is very passionate about optimization of workflows and targeting the goals of achieving operational excellence. Dr. She has no conflicts of interest to report.

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Evaluating Opioid Dispensing Rates among Pediatrics and Young Adults based on CURES Data Reporting in California from 2015-2019

Michael T. Phan, PharmD; Courtney Wong; Daniel M. Tomaszewski, PharmD, PhD; Zeev N. Kain, MD, MBA; Brooke Jenkins, PhD; Candice Donaldson, PhD; Michelle Fortier, PhD; Sun Yang*; BSPharm, PhD (*Corresponding author)

Abstract

Background
Receipt of opioid prescriptions in pediatric and young adult patients may be a risk factor for future opioid misuse. Data from prescription drug monitoring programs provide insight on outpatient opioid use. In our study, we analyzed the opioid dispensing rates for pediatrics and young adults in California.

Methods
A secondary analysis was performed from 2015-2019 using Controlled Utilization Review and Evaluation System data. This database provides dispensing data of controlled substances in California. Patients younger than 25 years who were prescribed opiates were analyzed by county. We further divided them into two groups (children: ≤14 years; adolescents and young adult: 15-24 years). Descriptive statistics and heat maps were used to illustrate the trends in opioid usage among different age groups.

Results
The overall percentages for the number of opioids being dispensed to patients aged <25 years have decreased over the past four years. In 2015, 6 out of 58 counties in California were considered “high-rate” with >2.9% of opioids dispensed to patients younger than 25 years old; in 2019, this number reduced to zero. Patients 25 and older received a higher proportion of opioids compared to younger populations; in 2019, 35.91% of opioids were dispensed to patients 45-64, and 8.92% to patients younger than 25.

Conclusion
Pediatric opioid prescriptions have declined over the recent years. However, a high degree of variability of prescription rates between demographic counties was noted. More studies are warranted in order to understand this discrepancy in opioid prescribing among pediatric and young adult patients.

Introduction
The opioid epidemic has been widely viewed as a serious public health problem that has been focused primarily on adults in the US. However, a similar pattern of increased prescribing rates of opioids in adolescents and young adults have also been noted.[1,2] This pattern of opioid use in this patient population has contributed to increased reports of accidental poisoning, misuse and abuse, overdose-related hospitalizations, and death.[3-5] From 1999-2016, the pediatric mortality rate increased by 268% in children and adolescents due to opioids.[6] In an effort to enhance consistency in the prescribing of opioids, the CDC published its first guidelines regarding the use of opioids in 2016.[7] Since the release of these guidelines, national opioid use in this population has declined significantly.[8,9]

Opioids are commonly used in the pediatric pain management paradigm. In an earlier cross-sectional observational study, 64% of clinicians were reported to have prescribed an opioid to manage acute pain in pediatric patients.[10] Managing opioid usage in children needs to be personally tailored and monitored closely due to the developmental changes in young children and adolescents. Their unique developmental characteristics result in the distinct pharmacodynamic and pharmacokinetic features which differ from those seen in adults.[11] Although guidelines exist for opioid prescription in pediatrics,[12-14], the resources and training provided to healthcare professionals are limited. This makes pain management in the pediatric population more challenging, especially in outpatient settings, and often leaves prescribers to rely on their clinical judgment and experience when prescribing opioids.[2,15]

There has been a significant pullback from opioid prescribing in both adults and pediatric patients. From 2012 until 2018, the overall opioid prescribing rates fell from 81.3 to 51.5 prescriptions per 100 persons.[8] With the heightened attention being placed on the use of opioids overall and growing concerns over the use of opioids within pediatric and young adult populations, there is a growing number of research studies being published. However, few studies to-date have focused on state-specific or county-level analysis. Previous research that analyzed variations in regional opioid use across the United States did show higher rates of opioid prescribing for pediatric and young adult patients in the western region of the United States, which includes the state of California, as compared to opioid prescribing rates in other areas of the country.[8] To better understand the use of opioids among pediatric and young adult patients in California, we conducted an analysis of publicly available data from the state’s controlled substance reporting system. The goal of the study was to examine county-level trends in opioid prescribing in pediatrics and young adults in California from 2015 to 2019. The California Controlled Substance Utilization Review and Evaluation System (CURES) data, which is collected by the California Department of Justice (DOJ), was used for the analysis of the study.

Objective
The primary outcome of the study is to assess the changes in county-level opioid dispensing rates to pediatric and young adult patients in California from 2015-2019. A secondary outcome is identifying whether the presence of a pediatric hospital within the county impacts the likelihood the county is deemed a “high-rate” county, defined as having a high magnitude of opioids dispensed to pediatrics and young adults.
Methods

CURES Database
The Controlled Substance Utilization Review and Evaluation System (CURES) is a prescription drug monitoring program that longitudinally tracks all Schedule II-IV controlled substance prescriptions dispensed in the state through California’s Department of Justice (DOJ). The DOJ provides aggregated reports to the general public based on the data collected through the CURES and makes them available online. All data analysis conducted as part of this study were conducted using the aggregated datasets available from the publicly available online reports published from 2015-2019.

California state law requires dispensing pharmacies, clinics, or other dispensers of Schedule II-IV controlled substances to provide specified dispensing information to the DOJ on a weekly basis. The patient’s identifiable information, such as name, date of birth, gender, and address, are also recorded, in addition to the prescriber and pharmacy identities with DEA registration numbers. The publicly available data provided by the DOJ used to conduct this research study are a series of limited datasets which have been deidentified and reported as aggregates based on various patient and provider factors. For example, metrics such as morphine milligram equivalents (MME) and pill counts were automatically calculated by CURES and prepared as composite data from the CA DOJ. This study is exempt from Institutional Review Board (IRB) approval, given the nature of the data analyzed. The public CURES database includes the number of patients receiving opioid prescriptions in a patients’ locale based upon the county, gender, age group (<14 years, 15-24 years, 25-44 years, 45-64 years, and ≥65 years), and year, from 2015 to 2019. To analyze how opioid dispensing rates are affected by the presence of children’s hospitals, these hospitals were identified using a directory available from the Children’s Hospital Association.

Study Population
The CURES data used to complete the analysis of the study includes all information reported for opioid prescriptions dispensed in California. This data included reports of the number of patients dispensed opioids, broken up by the year, county, and preset age groupings. Stratification of age was maintained from the reported age groups in the DOJ’s publicly reported CURES statistics. All 58 counties in California were included in the study.

Study Outcome
The primary outcome of the study was the changes in county-level opioid dispensing rates to pediatric and young adult patients in California from 2015-2019. Our secondary outcome was identifying whether the presence of a local pediatric hospital is associated with a county’s likelihood of being a “high-rate” county, defined as having a high magnitude of opioid prescriptions to pediatrics and young adults.

Statistical Analysis
Descriptive statistics and heat maps were used to illustrate trends in opioid prescribing among different age groups and demographic regions and counties over the years studied. The total number of opioid prescriptions was collected from the datasets and analyzed in comparison to other demographic regions and counties in California. Opioid prescription trends were evaluated through three methods.

Overall rate of opioids dispensed to pediatric and young adult patients: First, the percentage of pediatric and young adults (<25 years old) dispensed opioids in each county was examined. “High-rate” counties were defined as counties that had a calculated percentage of opioid dispensing greater than 2.9% of the population, which is one standard deviation above the average rate reported in 2015, and is also the rate that marked the 80th percentile of counties in 2015. The trends were determined by comparing the heatmaps generated by different years.

Proportion of opioids dispensed to pediatrics and young adults: The next analysis examined the proportion of opioids prescribed to the pediatric and young adult population, comparing it to the total number of opioids prescribed in each county. Specifically, patients aged 15-24 years old in their respective counties were examined, broken down by year. Using the same method, the distribution of opioid prescriptions across each specific age group (<14, 15-24, 25-44, 45-64, ≥65) in their respective county was visualized. Proportions of opioid prescriptions for each specific age group were calculated and demonstrated in the heatmap format using a color scale, where the red color represents the highest proportions seen.

Prevalence of a pediatric hospital on opioid dispensing rate: The last point examined opioids dispensed to patients ≤14 years old within the total population of the county. As in the first analysis, “high-rate” counties were defined by rates which were one standard deviation above the average rate reported in 2015, which was calculated to be 2.18%. These counties were highlighted in red and children’s hospital locations were identified and marked on the map.

Results
Based on census data, there were 37 million residents in California within our study time period, 2015-2019. During the individual years reported, the year of 2015 had the highest number of individual patients with an opioid prescription dispensed, with 7.12 million total patients receiving an opioid. In 2016, the number of patients with opioid prescriptions significantly decreased, with 4.81 million patients receiving an opioid (Table 1). Following the substantial reduction in overall number of patients being dispensed opioids from 2015 to 2016, the number of patients remained relatively stable from 2016 to 2019. In the final year of reporting, 5.01 million patients received an opioid in 2019. A similar trend also persisted when examining other metrics such as total morphine equivalent dose (MME) prescribed, CII-IV pill count, and total CII-IV prescription count per year. Notably, a higher quantity of CII pills and prescriptions were dispensed to the pediatric and young adult population each year compared to the amount of CIII-IV substances given to the same population (Table 1).

When evaluating patients younger than 25 years of age, similar patterns of dispensing were present. Similar to the overall statewide population, patients 24 years old or younger reported the largest number of patients dispensed an opioid in 2015 (780,630 patients), followed by a significant drop in patients dispensed an opioid in 2016 (473,764 patients), followed by a significant increase in 2017 (643,709 patients), and eventually noting a consistent decrease from 2018 (537,197 patients) to 2019 (454,002 patients) (Table 1). The number of “high-rate” counties for those aged <25 years old significantly decreased from six in 2015 to zero thereafter.
Table 1. Characteristics of the CURES database collected by the California Department of Justice from 2015-2019.

<table>
<thead>
<tr>
<th>Year</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Population</strong></td>
<td>37,249,464*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Patients on Opioids</strong></td>
<td>7,126,766</td>
<td>4,812,163</td>
<td>6,339,863</td>
<td>5,654,496</td>
<td>5,013,324</td>
</tr>
<tr>
<td>≤14</td>
<td>112,004</td>
<td>68,287</td>
<td>93,699</td>
<td>74,012</td>
<td>61,564</td>
</tr>
<tr>
<td>15-24</td>
<td>668,626</td>
<td>405,477</td>
<td>550,010</td>
<td>463,185</td>
<td>392,438</td>
</tr>
<tr>
<td>25-44</td>
<td>2,052,961</td>
<td>1,300,451</td>
<td>1,748,964</td>
<td>1,509,500</td>
<td>1,293,749</td>
</tr>
<tr>
<td>45-64</td>
<td>2,594,842</td>
<td>1,789,532</td>
<td>2,272,118</td>
<td>2,017,861</td>
<td>1,765,536</td>
</tr>
<tr>
<td>≥65</td>
<td>1,698,333</td>
<td>1,248,416</td>
<td>1,675,072</td>
<td>1,589,938</td>
<td>1,500,037</td>
</tr>
<tr>
<td><strong>Number of Opioid Prescribers</strong></td>
<td>123,930</td>
<td>116,514</td>
<td>123,765</td>
<td>126,346</td>
<td>122,946</td>
</tr>
<tr>
<td><strong>Number of Schedule II Prescribers</strong></td>
<td>120,258</td>
<td>115,414</td>
<td>124,065</td>
<td>122,769</td>
<td>119,940</td>
</tr>
<tr>
<td><strong>Number of Opioid Prescriptions Filled Including Refills</strong></td>
<td>—</td>
<td>12,492,715</td>
<td>18,759,427</td>
<td>16,626,400</td>
<td>14,824,350</td>
</tr>
<tr>
<td><strong>Number of Registered Dispensers</strong></td>
<td>—</td>
<td>36,364</td>
<td>37,712</td>
<td>37,501</td>
<td>36,899</td>
</tr>
<tr>
<td><strong>Total Opioid Prescriptions</strong></td>
<td>—</td>
<td>12,492,715</td>
<td>18,759,427</td>
<td>16,626,400</td>
<td>14,824,350</td>
</tr>
<tr>
<td><strong>Total MME</strong></td>
<td>1,093,698,465</td>
<td>605,966,592</td>
<td>772,949,844</td>
<td>918,235,514</td>
<td>777,690,541</td>
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<tr>
<td><strong>Pill Count</strong></td>
<td>137,726,061</td>
<td>81,779,125</td>
<td>123,648,425</td>
<td>110,416,083</td>
<td>97,374,688</td>
</tr>
<tr>
<td><strong>Rx Count</strong></td>
<td>3,283,322</td>
<td>1,997,999</td>
<td>3,057,174</td>
<td>2,765,409</td>
<td>2,482,719</td>
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</table>

* "-" means data not available based on the publicly-available databases posted online.
* the total population is based on US Census Data that was aggregated by the California Department of Justice and is representative of the population from 2015-2019
Comparing opioid dispensing rates on a county-level from 2015-2019, counties overall reported reduced numbers of opioid prescriptions dispensed to patients younger than 25 years. However, the rate of dispensing in central California counties consistently remained higher than that of other regions. In addition, at an overall state-level of reporting, as well as, within individual counties, there was an increase in the number of patients aged less than 25 years old being dispensed an opioid prescription from 2016 to 2017, followed by a steady decline afterwards. As shown in Table 1, the overall number of patients being dispensed an opioid has declined approximately 10% and 11% per year on average among pediatric (≤14 years) and young adult (15-24 years old) patients, respectively.

When specifically evaluating the proportion of patients aged 15-24 years old accounting for opioid prescriptions dispensed, this proportion has decreased each year since 2015, with 15-24 years old accounting 9.38% of patients dispensed an opioid in 2015 dropping to 7.82% in 2019 (Figure 2). For this age group, higher proportions of dispensed opioids were observed in central and southern California than in other regions, with relatively fewer changes in the later years. Alpine County reported that 15.23% of individuals aged 15-24 were dispensed an opioid in 2015, the highest percentage of the state that year. The county with the lowest percentage was Trinity County, with a rate of 3.56% in 2019. The largest year over year proportion drop of any county was observed in Alpine Country from 2015 – 2016, with a proportion of 15.23% in 2015 and 5.79% in 2016 (an absolute proportion drop of 9.44%). However, Alpine also noted a significant surge in this proportion from 2016-2017, increasing by an absolute proportion of 8.3%. Of note, given the high number of individuals aged 15-24 years having an opioid dispensed among residents, Alpine County also accounted for the highest proportion of opioids within this age group in every year of the analysis, with the exception of 2016.

Among all the opioid prescriptions, the amount of opioids dispensed to individuals aged 25 years and older was consistently higher than those under the age of 25 years old.; similar patterns were observed in every year examined (Figure 3). The average percentage of opioids being dispensed to individuals ≤14 years old in 2015 was 1.63%, which is similar to the 1.25% recorded in 2019. The average percentage of total opioids dispensed to adolescents and young adults (15-24 years old) in 2015 was 9.11%, with the actual percentage dropping to 7.29% in 2019 (Figure 2). Compared to other age groups, individuals ≤14 years old received the lowest percentage of opioid medications over the years (Figure 3). On average, approximately 27.2%, 37.5% and 24.6% of opioids prescriptions were dispensed to patients aged at 25-44, 45-64, and 65+ years old respectively in 2015, and in 2019, those averages shifted to 23.46%, 35.91%, and 32.08% respectively.

For individuals aged 14 years old and younger, counties were deemed “high-rate” if the rate of opioids prescriptions given to these patients exceeded 2.18%, or one standard deviation above the average rate of opioids dispensed to patients in this age range (Figure 4). Rates were calculated as opioids dispensed per total population, and “high-rate” counties were marked in red. In 2015, there were seven identified “high-rate” counties for patients ≤14 years old. The following year, the total number of high-rate counties dropped to 3, and then increased back to 4 in 2017. By 2019 the number of “high-rate” counties had dropped to zero. Overall, most of the “high-rate” counties that had a prescription rates above 2.18% in individuals aged 14 years old or younger were located in Central California.

When evaluating counties being deemed to be “high-rate” counties in relationship to opioid dispensing to individuals aged 14 years old or younger, none of the “high-rate” counties had a registered children’s hospital located within the county. Due to the absence of registered children’s hospitals in any of the “high-rate” counties, there was no possibility of running a statistical test to examine differences in opioid-use associated with the presence of a hospital from which to draw a conclusion. When evaluating the location of children’s hospitals and the relationship to opioid dispensing, there did not appear to be an association with higher rates of opioid dispensing among those aged 14 years old and less, as none of the “high-rate” counties contains a registered children’s hospital.

**Discussion**

In our study, we consistently observed a decline in opioid prescriptions from 2015 to 2016 among all patient populations recorded in California. The timing of this downturn is consistent with trends reported nationally and coincides with the release of the updated CDC guidelines for opioid prescribing that encourage a general reduction in opioid use across most clinical situations. To our knowledge, this is the first study examining county-level opioid dispensing in California within the time period of this study. Although studies examining national trends generally agree that the use of opioids in pediatric patients has overall decreased in recent years, there is uncertainty with how specific regions contribute to the trend – one study reported the western states with the lowest prescribing rates, while another found the West to have the highest. A notable point of observation is that the CDC guidelines exclude patients younger than 18 years old; yet, our results suggest that patients younger than 18 have also experienced a decline in opioid prescribing after the publication of the updated CDC guidelines. It is uncertain to what degree that the guideline updates have affected opioid use in the pediatric, adolescent, and young adult population. However, it is likely that practitioners have interpreted these guidelines to suggest that opioids should be restricted for use in these populations in situations where no other pain management strategy is likely to achieve necessary pain reduction. Although it is not possible for us to validate any causes for the decline of opioid prescriptions based on the current CURES data, our study suggests that there may be a potential impact from the CDC guideline upon the decrease in opioid prescribing among pediatric patients given the congruence of the timeline. In addition, the results of our study suggest that following an initial sharp decline in the number of patients being prescribed an opioid from 2015 – 2016, there was a significant rebound effect seen in 2017. This may be the result of practitioners reducing opioid prescribing too rapidly. The steady decline observed from 2017 through 2019 suggests that practitioners once again made efforts to reduce opioid prescribing after the 2017 rebound.

This decline of opioid prescriptions among pediatric and young adults also aligned with the mandate for all California licensed prescribers to register for access to CURES by 2016, and for mandatory CURES consultations to start in 2018. From January 2016 to January 2017, there was a 176% increase in registered CURES prescribers in California; within pharmacy, there was a 64% increase of pharmacists. This and other efforts being made within the state of California to reduce overall
**Figure 1.** Opioid dispensing rates to patients younger than 25 years old (2015-2019).[16]*

<table>
<thead>
<tr>
<th>County</th>
<th>Abrv</th>
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<td>San Luis Obispo</td>
<td>SLO</td>
<td>Stanislaus</td>
<td>STA</td>
</tr>
</tbody>
</table>

*Rates were calculated as total opioids dispensed per total population of the respective county.

**Figure 2.** Proportion of opioids dispensed to 15-24 year old patients.[16]*

*Proportions calculated as opioids dispensed to 15-24 year olds among total opioids dispensed per respective counties in California from 2015 to 2019.
Figure 3. Comparison of opioids prescriptions among different age groups in 2015 and 2019 from data collected by DOJ.\textsuperscript{[16]}* 
A) ≤14 years old; B) ≥ 65 years old.

*Proportions calculated as opioids dispensed to the age group of interest per total opioids dispensed within the county.
opioid prescribing may have contributed to the drop in opioid dispensing rates following the 2017 rebound. Similar reductions in opioid use were also observed in other studies which examined state opioid prescribing rates after the implementation of a prescription drug monitoring program (PDMPs). Studies have also demonstrated a reduction in the prescribing of schedule II opioids after mandating registration to PDMPs. While the initial intent of a PDMP is to reduce the number of prescriptions given to high-risk drug abusers by identifying patients who regularly fill controlled substances, there may have been a secondary effect where prescribers and dispensers adjusted their overall prescribing and dispensing practices due to the heightened awareness of PDMPs.

In California, the total number of dispensed schedule II substances to pediatric and young adults also declined over the 4-year period, with the biggest drop occurring in 2016. The specific drug breakdown is not available with the given dataset, which restricts the ability to distinguish which of those schedule II substances dispensed were opioids. However, it was noted that a higher amount of schedule II substances was dispensed to the pediatric and young adult population, compared to the schedule III or IV substances. This may warrant further examination, as pediatric exposure to schedule II opioids has been shown to result in a higher likelihood of future alcohol use disorder, cannabis use disorder, or any other drug use disorder, compared to opioids belonging to "lower" scheduled controlled substance classes.

Our study also revealed that there was a disproportionate decrease in opioids among the different age ranges. Patients older than 65 had the smallest degree of reduction in opioids dispensed, whereas pediatric and young adult patients had the some of the largest reduction rates. Thus, the fraction of total opioids dispensed to patients older than 65 increased, while the percentage dispensed to younger patients decreased. This trend suggests that there has been exceptional efforts in diminishing opioid use in age groups deemed at risk of misuse, namely, younger populations such as pediatrics and young adults. Meanwhile, older populations such as those above 65 years old, may have persistently higher rates due to population characteristics such as more cases of palliative care and chronic pain. Opioid prescriptions for younger populations tend to treat acute issues such as surgical procedures and sport injuries – inherently, these medical issues tend to capture opioid naïve patients who are less likely to require a prolonged use of opioid compared to chronic pain patients. Therefore, the discrepancy observed in opioid prescribing among different age groups may be driven by the differences in their medical conditions that are typically experienced in each age group.

Although the fraction of patients who received opioids at ages 15-24 years old was relatively small compared to older age groups, providers should continue to be diligent with opioid use in this population due to concerns for misuse and abuse. The probability of prescription opioid abuse declines with increasing age at the first opioid exposure, with the peak risk being observed in patients using opioids for the first time as adolescents or young adults aged 18-24 years old. This age group itself has been shown to be a risk factor for drug abuse, which only further compounds the problem. Additionally, a previous study examining the CURES database found that younger patients and female patients were associated with using multiple prescribers and pharmacies for opioid prescriptions. However, the data from this study is limited as it examines opioid prescriptions in 2006, which is significantly earlier than the data used in our study. Another study examining CURES opioid prescriptions from 1999 until 2007 revealed that the highest increase of opioid use was among 18-44 year old females, whereas males aged 65 and older had the lowest rate of increase. Juxtaposed with our study, which takes place during an overall effort to curb the opioid crisis, we observed an overall decline with the most change appearing to occur among patients younger than 25.

To our knowledge, few studies exist that examine county level factors in California that affect opioid prescribing. Since a large percentage of pediatric opioid prescribing comes from hospitals at discharge, we attempted to determine if the presence of a pediatric hospital would affect opioid prescribing rates. Our results found that none of the “high-rate” counties had a pediatric hospital, which may indicate that the presence of a pediatric hospital equipped with pediatric-specially trained providers may improve opioid prescribing practices. Additional studies are needed, as others have suggested that opioid prescribing practices between general and pediatric

Figure 4. Children hospitals near the “high-rate” counties in CA from year 2015-2019.*
hospitals are similar to one another. Other sources of opioid prescriptions may be driving county-level factors, as there is a positive correlation between the number of available physicians within a patient’s residential county and number of prescribers and pharmacies that a patient uses per year. In respect to national trends, one study examining congressional districts in 2016 observed that Northern California, Eastern Arizona, and Nevada had relatively high opioid prescribing rates, second only to areas along the Appalachian and throughout the South. The same study also found that 3 of the 10 lowest rates were from regions in California. In addition, county-based factors such as median household income, average educational attainment, race/ethnicity, and physician availability may also significantly impact patient’s choice of multiple prescribers and pharmacies. How this information translates to opioid use in pediatrics is unclear, and warrants further investigation.

Another important consideration is the proportion of opioid prescriptions given per patient, as some opioid prescription rates may be driven by individuals receiving a substantial number of opioid prescriptions and those demonstrating drug-seeking behaviors, such as doctor-shopping. Our results show that less than 1% of patients are non-unique patients, but it is unclear how this number is distributed among those aged less than 25 years old. Additionally, non-unique patients who receive an opioid are not necessarily misusing opioids and may simply be managing more long-term pain disorders. Other studies examining CURES data has suggested that past rates of doctor shopping ranged from 1.25% to 5.31%, with the highest number being female patients older than 65; pediatric and young adult populations were not considered a high risk group. Factors that affect multiple prescriber and pharmacy utilization among opioid users is understudied, but it is suspected that these factors may be similar to those that predict illicit drug use, such as psychological factors, socioeconomic status, and neighborhood disadvantage. Seeking multiple prescribers may also be driven by clinically legitimate reasons, such as having multiple comorbidities that are treated by separate physicians, or suffering from undertreated pain due to the restricted opioid prescribing after the publication of the CDC guidelines. Although our data does not reveal age-specific information related to individuals being dispensed multiple opioid prescriptions, it suggests that there remains a very low number of patients that are non-unique opioid recipients in California from 2015 to 2019.

Ultimately, the tightening of opioid prescribing and dispensing is intended to improve public health outcomes and reduce overdose morbidity and mortality. According to the CDC, there was an overall reduction in deaths due to opioid prescriptions in California from 2014-2018. Yet, deaths due to illicit and synthetic opioids have increased in the state, which have been driving up the overall opioid mortality rates. This is also mirrored on a national scale, which enforces the complexity of the opioid climate. Simply reducing opioid prescriptions does not improve the opioid mortality rate and further investigation is needed to identify effective research-driven policies surrounding opioid use.

Limitations
Given the retrospective, cross-sectional nature of the study, we are limited to reporting opioid prescribing rates and are restricted from conducting further predictive or causal analyses. While CURES data captures all controlled prescriptions that are dispensed through a pharmacy, it does not include federally regulated pharmacies, such as those under the jurisdiction of the Department of Defense and Indian Health Services. The application of our findings is also limited, as it lacks comparison to other states’ pediatric prescribing rates during the same studied time period. Further, not every pediatric-specific hospital may have been captured in this study, as it is not mandatory to join the Children’s Hospital Association. Another limitation of this study is its lack of analyzable variables that have been shown to affect opioid prescribing rates, such as sex/gender. This analysis was limited to the available information that was published on the CA DOJ website, which provided aggregate data sets with restricted manipulation. Therefore, we were unable to perform additional subgroup analyses and account for other demographic factors such as different age groupings, sex, race/ethnicity, and medication information (e.g. opioid name, quantity, and prescriber information).

Conclusion
There has been an overall downtrend of pediatric and young adult patients on opioid prescriptions in California. Safer practices in this population should not be limited to reducing opioid prescriptions, as evidenced by the continued prevalence of opioid deaths despite the downtrend of prescribed opioids. Older adolescents and young adults are at risk of opioid misuse and abuse – identifying the environmental and intrinsic mechanisms that lead to this risk is essential, and targeting communities and regions with the higher risk may mitigate the issue substantially. Efforts aimed at public health policies should be specific and target at-risk populations, rather than be generalized, as this may prove ineffective.

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References

30. Schroeder AR, Dehghan M, Newman TB, Bentley JP, Park KT. Association of Opioid Prescriptions From Dental Clinicians for US Adolescents and Young Adults With Subsequent Opioid Use and Abuse. JAMA internal medicine. 2018.


43. Multiple Cause of Death 1999-2018 on CDC WONDER Online Database released in 2020. Data are from the Multiple Cause of Death Files, 1999-2018, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.: Centers for Disease Control and Prevention, National Center for Health Statistics. ; 2020 [Available from: http://wonder.cdc.gov/mcd-icd10.html.


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The Role of Intern Pharmacists in Implementing Innovative and Sustainable Practices to Enhance Rates of Non-influenza Immunizations

Kevin Nguyen, PharmD; Natalya Ignatyeva, BS; Karla Jorgensen-Ponce, PharmD; Anamika Nijum, PharmD; Analia Nguyen, PharmD; Akash Patel, PharmD; Yvonne Pham, PharmD; Kathryn Hollenbach, PhD, MPH; Christina Mnatzaganian, PharmD, BCACP, APh

Abstract

Background
Intern pharmacists are likely an underutilized resource for addressing immunization barriers and improving immunization rates. Studies have addressed methods that pharmacists use to improve immunization rates, but few have focused on the role of intern pharmacists, with particular emphasis on non-influenza immunizations.

Methods
An online survey was distributed through email listservs associated with California pharmacy schools and organizations. Data collected included title ("pharmacist" or "intern pharmacist"), practice setting, perceptions of the intern pharmacists' role in improving immunization rates (strongly agree to strongly disagree using a 5-point Likert scale), and opinions regarding potential implementations. Immunization barriers were assessed using a 9-point scale, from least to most feasible to be addressed. Statistical comparisons between intern pharmacist and pharmacist responses were made using chi-square or Fisher's exact tests.

Results
A total of 133 respondents completed the survey. The immunization barrier most likely to be successfully overcome by intern pharmacists was lack of patient awareness. There was strong support in favor of intern pharmacists having greater involvement in programs that increase patient non-influenza immunization rates. The two most feasible implementations by intern pharmacists were determined to be intern-led college/university campus clinics providing free non-influenza immunizations and educational booths/outraches that raise awareness about immunizations.

Conclusion
Identification of immunization barriers capable of being addressed by intern pharmacists and effective intern pharmacist-led initiatives may contribute to enhanced immunization outcomes. Future steps include the implementation of intern pharmacist-led activities and further evaluation of whether these intern pharmacist-specific initiatives contribute to increasing non-influenza immunizations.

Keywords
non-influenza immunizations; intern pharmacists; barriers; immunizations

Objectives
The objectives of this study were to:

- Assess perception of greater intern pharmacist involvement in implementing non-influenza immunizations.
- Identify important barriers to administering non-influenza immunizations that can be addressed by intern pharmacists.
- Determine innovative and effective intern pharmacist-led implementations to increase non-influenza immunization rates.

Background
Immunizations are a key public safety measure supported by the Centers for Disease Control and Prevention (CDC) to decrease the prevalence, morbidity, and mortality of vaccine-preventable diseases. Without recommended immunizations, individuals risk their health and the health of those vulnerable to illness. The CDC Advisory Committee for Immunization Practices recommends immunizations for people at targeted ages with guidelines for vaccine-preventable illnesses. However, the American population remains below desired levels of immunization rates.

With immunization authority in all states, pharmacists improve immunization access as frontline healthcare providers in a large number of locations. Although pharmacists are capable of improving immunization rates, several barriers restrict immunization access including low prioritization, immunization opposition, cost, insurance, accessibility/supply, lack of awareness, cultural/geographical background, and personal beliefs. Despite these barriers, immunization rates increase after pharmacist interventions and collaboration between health systems and community pharmacists.

Intern pharmacists are trained to screen for, administer vaccines, and counsel patients on immunization importance. Few studies have explored intern pharmacists’ involvement or role in increasing immunization rates. One study found that university staff and students were satisfied with services provided by intern pharmacists during an influenza campaign. A review of 18 studies demonstrated that intern pharmacists increased pneumococcal immunization rates in both inpatient and community settings. Despite this, intern pharmacists likely remain an underutilized immunization resource, particularly outside of the influenza season.
Further research on their roles in non-influenza immunizations is crucial to improve health outcomes. Thus, the objectives of this study were to examine pharmacist and intern pharmacist perceptions of intern pharmacists’ roles in increasing non-influenza immunization rates, identify barriers that intern pharmacists may address, and determine innovative and effective intern pharmacist-led implementations to increase non-influenza immunization rates.

**Methods**

An anonymous cross-sectional survey was distributed through SurveyMonkey (San Mateo, CA) to evaluate California pharmacist and intern pharmacist perceptions of the intern pharmacist’s role in immunizing the community. State-wide pharmacy organizations including California Pharmacists’ Association (CPhA) and California Society of Health-System Pharmacists (CSHP) utilized membership listservs to distribute the survey invitation to pharmacists and intern pharmacists. CPhA included the survey link in weekly emails sent to approximately 4,300 members and posted the link on its website for five weeks. CSHP sent one email invitation to approximately 4,000 members. Additionally, the survey invitation was once sent to intern pharmacists on California Pharmacy Student Leadership teams (96 members) and twice to all students, faculty, alumni, and preceptor listservs at the University of California (UC) San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences.

Data were collected for five weeks in 2017. Respondents indicated their title (“Pharmacist” or “Intern Pharmacist”) and pharmacy practice setting. Immunization barriers that may be addressed by intern pharmacists were assessed using a 9-point scale ranging from least to most feasible. Perceptions of intern pharmacists’ roles in improving immunization rates (ranging from “Strongly Disagree to “Strongly Agree”) and opinions regarding potential interventions (“Not feasible in any setting”, “May be feasible in any setting”, “Feasible in any setting”, and “Currently implemented in my practice”) were also evaluated.

Data were summarized and responses were analyzed using STATA 15 (College Station, TX). Chi-square or Fisher’s exact tests were used to identify differences between pharmacist and intern pharmacist perceptions of potential interventions with alpha priori <0.05. Institutional Review Board approval was received from the UC San Diego Human Research Protections Program.

**Results**

A total of 133 responses were collected from 62 (46.6%) pharmacists, 70 (52.6%) intern pharmacists, and one undisclosed title (0.7%). The majority worked in community pharmacy (n=77, 36%) or health-system/hospital (n=45, 34%) settings, with the remainder in ambulatory/outpatient clinics (n=19, 15%) or other pharmacy settings (n=20, 15%). Perceived barriers were identified and the most prominent barrier listed by both groups as feasible for intern pharmacists to overcome was lack of awareness regarding necessary vaccines (Figure 1).

With respect to perceptions of intern pharmacists to improve non-influenza immunization rates, 95% strongly agreed or agreed they could implement immunization programs (Table 1). There was also a consensus (78%) that they receive sufficient training. Furthermore, 54% stated that greater emphasis on intern pharmacist-administered immunizations would not hinder practice site workflow.

Regarding the feasibility of intern pharmacists’ ability to conduct novel interventions to increase immunization rates, 63% felt that intern pharmacists should be involved in college/university campuses that provide free non-influenza immunizations (Table 2). Similarly, 62% agreed that raising immunization awareness via educational booths/outreaches would be feasible. The least feasible suggestion was intern pharmacists educating technicians to encourage patients to receive appropriate immunizations (13%).

Potential interventions were stratified by comparing responses between pharmacists and intern pharmacists. Pharmacists indicated a higher perceived feasibility for intern pharmacists routinely reviewing patient profiles and documenting appropriate vaccines and making targeted telephone calls regarding recommended immunizations (both p <0.01).

**Discussion**

This study examined pharmacist and intern pharmacist perceptions of intern pharmacists’ potential roles in improving non-influenza immunizations, overcoming immunization barriers, and interventions to increase administration rates. Most respondents felt that intern pharmacists can overcome immunization barriers and should have greater involvement in efforts that increase immunization rates.

![Figure 1. Perceptions of patient barriers to receiving immunizations and ability of intern pharmacists to address barriers.](image-url)
A CDC study examining pharmacist opinions identified a lack of awareness of necessary immunizations and incomplete immunization records as top immunization barriers, which are consistent with what our findings highlight as opportunities for intern pharmacist involvement.\(^{10}\) Our study is also congruent with previous results demonstrating that barriers can be addressed by intern pharmacists to increase non-influenza immunization rates.\(^{15}\) Initiatives from four pharmacy schools and a hospital concluded that intern pharmacists increased pneumococcal immunizations by screening patients admitted to their service.\(^{3,11}\) These initiatives are models that pharmacy schools and departments can build upon.

Based on survey responses, intern pharmacists are widely considered to be adequately prepared to improve immunization awareness. They are encouraged to counsel patients and may be the first and/or only contact that patients have when visiting the pharmacy. Cheung et al determined that 92% of patients would seek future immunizations from a community pharmacy based on their experience with intern pharmacist vaccinators.\(^{7}\) Intern pharmacists are ideally-placed healthcare practitioners who can educate patients and address barriers regarding this public health issue. Preceptors and pharmacist supervisors should encourage this, particularly in a population that is increasingly suspicious about vaccinations’ adverse effects and lacks understanding of immunization importance. Additionally, intern pharmacists are well-suited for involvement in community booths/outreaches to promote patient awareness and education and may further increase patient trust. At such events, intern pharmacists could review immunization records, recommend immunizations, and provide educational resources. Furthermore, they may have involvement in campus clinics that provide free non-influenza immunizations.

Participants felt that recommending appropriate immunizations while providing medication consultations was a more feasible approach for intern pharmacists than simply reviewing patient profiles to document appropriate immunizations, which highlights the possibility of adding immunization screening into the workflow. Participants may have felt that intern pharmacists educating technicians on how to encourage patients to receive recommended immunizations would be least feasible because technicians have more pertinent responsibilities or that intern pharmacists may not have the training necessary. Nevertheless, 600 vaccine screenings were successfully performed by technicians at an independent community pharmacy; thus, having intern pharmacists educate technicians on screening and encouraging immunizations may be beneficial.\(^{12}\)

### Table 1. Impressions regarding intern pharmacists’ capability to improve immunization rates.

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<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree (n)</th>
<th>Neutral (n)</th>
<th>Agree (n)</th>
<th>Strongly Agree (n)</th>
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<td>P (n)</td>
<td>IP (n)</td>
<td>P (n)</td>
<td>IP (n)</td>
<td>P (n)</td>
<td>IP (n)</td>
</tr>
<tr>
<td>Intern pharmacists should be more involved in programs that lead to increases in patient vaccination rates.</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>6.8% (4)</td>
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<td>Patients are receptive to an intern pharmacist’s immunization recommendations.</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>4.8% (6)</td>
<td>4.8% (6)</td>
<td>32.5% (41)</td>
</tr>
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<td>Patients are equally comfortable receiving immunizations from licensed intern pharmacists as they are with licensed pharmacists.</td>
<td>0.0% (0)</td>
<td>0.0% (0)</td>
<td>15.9% (20)</td>
<td>15.9% (20)</td>
<td>28.6% (36)</td>
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<td>Intern pharmacists receive sufficient training to recommend and administer patient-specific immunizations.</td>
<td>2.4% (3)</td>
<td>2.4% (3)</td>
<td>6.3% (8)</td>
<td>6.3% (8)</td>
<td>13.5% (17)</td>
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<td>Having intern pharmacists administer immunizations would be financially beneficial for my practice site.</td>
<td>7.2% (3)</td>
<td>7.2% (3)</td>
<td>5.6% (7)</td>
<td>5.6% (7)</td>
<td>23.3% (29)</td>
</tr>
<tr>
<td>Intern pharmacists receive sufficient training to recommend and administer patient-specific immunizations.</td>
<td>15.9% (20)</td>
<td>15.9% (20)</td>
<td>38.9% (49)</td>
<td>38.9% (49)</td>
<td>24.6% (31)</td>
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P=Pharmacist; IP=Intern pharmacist
Table 2. Perceptions of feasibility of intern pharmacist-led immunization implementations.

<table>
<thead>
<tr>
<th>Perception</th>
<th>Not Feasible in Any Setting (n)</th>
<th>May Be Feasible in Any Setting (n)</th>
<th>Feasible in Any Setting (n)</th>
<th>Currently Implemented in My Practice Setting (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intern pharmacists should routinely review patient profiles and document which vaccines would be appropriate for patients to receive.</td>
<td>3.3% (4) 1.8% (1)</td>
<td>55.4% (67) 37.5% (21)</td>
<td>34.7% (42) 50.0% (28)</td>
<td>6.6% (8) 10.7% (6)</td>
</tr>
<tr>
<td>Intern pharmacists should perform immunization screenings on patients waiting to be seen in the practice setting to identify possible vaccinations needed.</td>
<td>5.0% (6) 1.8% (1)</td>
<td>52.9% (64) 48.2% (27)</td>
<td>35.5% (43) 42.9% (24)</td>
<td>6.6% (8) 7.1% (4)</td>
</tr>
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<td>Intern pharmacists should recommend appropriate immunizations to patients while providing medication consultation.</td>
<td>5.0% (6) 3.6% (2)</td>
<td>40.5% (49) 39.3% (22)</td>
<td>47.1% (57) 46.7% (26)</td>
<td>7.4% (9) 10.7% (6)</td>
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<tr>
<td>Under the guidance of a licensed pharmacist, intern pharmacists should educate technicians on how to encourage patients to accept appropriately identified vaccination.</td>
<td>13.2% (16) 12.5% (7)</td>
<td>45.5% (55) 35.7% (20)</td>
<td>36.4% (44) 41.1% (23)</td>
<td>5.0% (6) 10.7% (6)</td>
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<tr>
<td>Intern pharmacists can raise awareness of immunizations through educational booths or outreaches at various pharmacy practice settings and in the community.</td>
<td>5.8% (7) 1.8% (1)</td>
<td>21.7% (26) 14.3% (8)</td>
<td>61.7% (74) 27.7% (18)</td>
<td>10.8% (13) 10.7% (6)</td>
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<tr>
<td>Intern pharmacists should receive additional training (either by the school or employer) to administer less commonly received vaccinations such as those required for traveling to specific countries.</td>
<td>5.8% (7) 1.8% (1)</td>
<td>36.4% (44) 41.1% (23)</td>
<td>52.1% (63) 32.3% (21)</td>
<td>5.8% (7) 5.4% (3)</td>
</tr>
<tr>
<td>Intern pharmacists should play a role in personalized telephone calls regarding recommended vaccinations.</td>
<td>7.4% (9) 0.0% (0)</td>
<td>53.7% (65) 51.8% (29)</td>
<td>35.5% (43) 41.1% (23)</td>
<td>3.3% (4) 7.1% (4)</td>
</tr>
<tr>
<td>Intern pharmacists should be involved in college/university campus clinics that provide free non-influenza vaccinations.</td>
<td>6.6% (8) 5.4% (3)</td>
<td>24.8% (30) 17.9% (10)</td>
<td>62.8% (76) 30.8% (20)</td>
<td>5.8% (7) 7.1% (4)</td>
</tr>
</tbody>
</table>

P=Pharmacist; IP=Intern pharmacist
Overall, respondents indicated similar perceptions regarding potential intern pharmacist-led interventions. Notably, pharmacists had stronger opinions supporting the feasibility of intern pharmacists to routinely review patient profiles and document appropriate vaccines and participate in personalized telephone calls regarding recommended immunizations. This may indicate that pharmacists are more confident in intern pharmacists’ capabilities to execute these interventions. This discrepancy should be considered when assessing potential interventions since pharmacists may be overestimating intern pharmacist capabilities and/or intern pharmacists may not feel prepared at that point in their education.

This study had several strengths including pharmacist and intern pharmacist participants, which is important in determining the feasibility of interventions. Respondents practiced in various settings, allowing for a broader scope of opinions. The data were also stratified by pharmacist and intern pharmacist perceptions to identify diverging viewpoints.

Limitations

Limitations included a low response rate at <1% despite a large survey distribution. However, it is possible that potential participants overlapped if they were members of both organizations and/or school-based listservs/emails. Given that the optional survey was distributed via organization listservs and/or associated with schools of pharmacy, there is a possible voluntary response bias; many recipients may have chosen not to complete it, thus responses may not accurately reflect the opinions of all pharmacists and intern pharmacists. We were also unable to obtain the number of website visits during the time our survey was posted on CPhAs website, so we could not assess the extent of any voluntary response bias. Due to the insufficient number of responses to perform certain adjusted analyses, analyses were limited to descriptive statistics. Lastly, pharmacists were not asked about their experience working with intern pharmacists, which could have influenced their opinions.

Conclusion

There was an overwhelming consensus that intern pharmacists could positively improve non-influenza immunization rates through diverse interventions. The identification of barriers that could be addressed by intern pharmacists is an integral step in determining how intern pharmacists can resolve these issues and improve immunization rates. Data on innovative and effective interventions can lead future research to explore these intern pharmacist-led initiatives and evaluate their effectiveness.

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<td>Dianna Slater</td>
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<td>Hana Sperling</td>
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<td>Robert Stein</td>
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<td>Khalid Taher</td>
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<td>Henry Truong</td>
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<td>Sun Yang</td>
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<td>Raynold Yin</td>
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