Volume 23 • Issue 6 www.pswi.org

November/December 2020

The Journal

of the Pharmacy Society of Wisconsin

NEW NAME. LASTING LEGACY.

Pioneering Health Care Education Since 1864

Since our founding as St. Louis College of Pharmacy, we have been committed to educating health care professionals and providers. Today – 156 years later – our commitment to leading in health care education remains strong.

With expanded academic programs, a growing reputation for research and new services to help students and alumni advance their careers, we are looking ahead toward a bright future.

Rest assured, St. Louis College of Pharmacy is here to stay. The College, along with the College of Arts and Sciences, will be part of the University umbrella, creating unique opportunities for growth and exploration in both colleges.

Our name has changed, but who we are remains the same.

We are a community of future pharmacists, physicians, nurses, researchers, entrepreneurs and more learning and growing together. We are leaders and innovators who support and challenge each other to solve society's most pressing health care challenges.

We are University of Health Sciences and Pharmacy in St. Louis.

Discovery begins here.

UNIVERSITY OF
HEALTH SCIENCES
& PHARMACY
in St. Louis

UHSP.EDU

November/December 2020

The Journal
of the Pharmacy Society of Wisconsin

Pharmacist Editor
AMANDA MARGOLIS, PharmD, MS, BCACP

Managing Editor & Creative Content Director
MEGAN GRANT, mgrant@pswi.org

Copy Editor
JENNIFER PITTERLE

CE Coordinator
PATRICIA THORNEWELL, PharmD

Peer Review Coordinators
MICHAEL NAGY, PharmD
KHYATI PATEL, PharmD
SARAH PEPPARD, PharmD, BCPS, BCCCP

ID Corner Series Coordinator
LYNNE FEHRENBACHER, PharmD, BCPS-AQ ID

Precepting Series Coordinator
MELISSA THEESFELD, PharmD

Open Access Coordinator
BRIANNA GROEN, 3rd Year PharmD Candidate

The Journal of the Pharmacy Society of Wisconsin is a professional publication for original research, review, experience, and opinion articles that link science with contemporary pharmacy practice to improve patient care. Together we can inspire each other to advance our profession with the single purpose of enhancing the lives of our patients.

Send correspondence to:
Megan Grant, Pharmacy Society of Wisconsin
701 Heartland Trail, Madison, WI 53717, phone: 608-827-9200, fax: 608-827-9292, thejournal@pswi.org

Authors are encouraged to submit manuscripts to be considered for publication in *The Journal*. For Author Guidelines, see http://www.pswi.org/Get-Involved/Publish-articles-in-The-Journal

Advertising inquiries:
Megan Grant, Pharmacy Society of Wisconsin, 701 Heartland Trail, Madison, WI 53717, phone: 608-827-9200, fax: 608-827-9292, mgrant@pswi.org

The Journal of the Pharmacy Society of Wisconsin (ISSN 1098-1853) is the official publication of the Pharmacy Society of Wisconsin. Subscription included in membership dues. Non-member subscription $90 per year. Outside North America, add $60. Single copies $25 ($50 if outside North America). Periodical postage paid at Madison, WI and additional offices. Published bimonthly by the Pharmacy Society of Wisconsin, 701 Heartland Trail, Madison, WI 53717. ***Postmaster:*** *Send address changes to PSW, 701 Heartland Trail, Madison, WI 53717.* Opinions expressed by contributors do not necessarily reflect those of PSW.

Up Front:
Looking Forward to 2021

by Amanda Margolis, PharmD, MS, BCACP

Towards the end of the year, we reflect on the previous year to see where we can improve, and look forward to the new year to set goals and plan. When looking back on 2020, it's clear that this year has been anything but normal. We all found ourselves needing to make significant changes in our practices in response to COVID-19. *The Journal* was no different, and it has been online-only since the March/April 2020 issue. Some of the changes practice sites have implemented have been beneficial. In the case of *JPSW*, we reformatted how articles are posted, which has allowed better analytics—we can better understand how readers are accessing articles.

Looking forward, 2021 will also bring updated reference formatting in *JPSW*. We use the American Medical Association (AMA) style, which was updated to Edition 11 in February 2020. In general, the updates streamline the citation format and make source materials easier to locate online. *JPSW* will be implementing AMA Ed. 11 starting with the January/February 2021 issue. A review of the updated citation format is available in Box 1 and is online at *jpsw*i.org/author-guidelines.

When reflecting on 2020, I am appreciative of our members'

JPSW's Year at a Glance

7 Articles with Pharmacist CE

3 Articles with Technician CE

12 Spotlights

5 PSW meeting recaps

6 COVID-19 articles

2 Journal series

2 Journal supplements

42 Articles peer reviewed

71 Peer reviewers

Box 1. JPSW Adopts AMA 11th Edition Reference Format

By Kristin Hesselback, 2021 PharmD Candidate, UW-Madison School of Pharmacy

In February of 2020, the American Medical Association (AMA) updated their citation manual to create the 11thedition. This edition of AMA standardized referencing formats and improves searching for the source material. To stay current with referencing guidelines of national pharmacy organizations and Wisconsin schools of pharmacy, JPSW will now require publications reference formatting to be in concordance with the AMA 11 standards. Authors can find the reference formatting criteria and current examples on the JPSW website under "For Authors and Reviewers" followed by "Author Guidelines".

Reference Formatting Review
Number references in consecutive numerical order (not alphabetically) as they are first mentioned in the text, tables, and legends with Arabic numerals that are superscripted in the text. If a reference is used more than once, all subsequent citations should use the original reference number. Cite all references in the text or tables. The references should be consistent with the AMA style.

References to Journal Articles:

- Author(s) (list all authors and/or editors up to six; if more than six, list "et al" after third name)
- Article title (and subtitle if present)
- Journal name as abbreviated in Index Medicus (italics)
- Year published (or online publication date if online only as month day, year)
- Volume number
- Issue number
- Part/supplement number if applicable
- Inclusive page numbers or e-locator
- DOI—in that order

Example: Wright D, Lee X, Sullivan GD, et al. Effectiveness and safety of apixaban as treatment of venous thromboembolism. *Thromb Haemost*. 2019;109(7):191-196. doi:10.1066/s-0038-1673689

Example ahead of print: Miller L, Smith K, Grant MF, et al. Pharmacist medication reviews to improve safety monitoring in primary care patients. Published online March 21, 2020. Nat Med. doi:10.1038. nm1024

participation in *The Journal*. Without the author contributors, peer reviewers, and *JPSW*'s Editorial Advisory Board, there wouldn't be a journal to share with our readers. I am grateful that we have been able to maintain thoughtful peer review this year, when it is especially difficult for our reviewers to fit those tasks into their schedules. But thanks to them, authors were able to continue to receive high-quality feedback. The full list of 2020 peer reviewers can be found in Box 2.

There is also a team of volunteers who make *The Journal* run. This includes our series coordinators, peer review coordinators, and open access coordinator. Lynne Fehrenbacker coordinates the ID Corner series, and Melissa Theesfeld coordinates the Precepting series. Both are high-quality, well-received series that add value to *The Journal*. Patti Thornewell serves as the CE Coordinator and manages the peer review for CE articles, as well as the ACPE requirements for each issue of *The Journal*. Michael Nagy, Khyati Patel, and Sarah Peppard all serve as writing club mentors at their respective schools of pharmacy and assist in managing the peer reviews for *the journal*. This group helps with soliciting articles, creating opportunities for student writing and mentoring, and ensuring submitted manuscripts are of high quality prior to publication. Brianna Groen serves as the open access coordinator and, along with Michael Nagy, implemented the redesign of how our articles are posted for open access.

Lastly, there are two outstanding individuals who make up the editorial team of *JPSW*. Megan Grant is the Managing Editor & Creative Content Director for *JPSW*. She completes all of the formatting and layout, which make *The Journal* stand out. Jennifer Pitterle started this fall as the Copy Editor for *JPSW*. The addition of Jennifer to the *JPSW* team will bring an increased excellence in writing! I am excited to have both Megan and Jennifer to help manage journal content.

I hope everyone can find a few moments to reflect on those silver linings from 2020 as we look forward to starting 2021. Have a safe and happy holiday season.

- Amanda Margolis, PharmD, MS, BCACP
Pharmacist Editor

Box 1. JPSW Adopts AMA 11th Edition Reference Format Cont.

References to Books:

- Chapter Author(s) (list all authors up to six; if more than six, list "et al" after the third name)
- Chapter title (if any)
- Book authors/editors/translator (list all up to six; if more than six, list "et al" after the third name)
- Title of book and subtitle (italics)
- Volume number and title if more than one
- Edition number if not the first
- Name of publisher
- Copyright year
- Page numbers

Example chapter reference: Livingston BR. Teaching from home as a parent. In: Garner T, Norwali P, Edison MN. *Living in the era of COVID-19*. Academics United Publishing; 2020:62-84.

Example whole book reference: Guy MJ, Miller SN. Obesity and Nutritional Health. 2nd ed. Wisconsin Press; 2017.

References to Websites:

- Author(s) (list all authors up to six; if more than six, list "et al" after the third name) or group name
- Title of specific item cited (if none use the organization's name)
- Name of website
- [Publish date]
- Updated [date]
- Accessed [date]
- URL

Example: Recommended vaccines for healthcare workers. Centers for Disease Control and Prevention. April 15, 2014. Updated May 2, 2016. Accessed October 31, 2016. https://www.cdc.gov/vaccines/adults/rec-vac/hcw.html

Box 2. 2020 Peer Reviewers

Kayci Arnhoelter
Nitish Bangalore
Kelsie Basso
Megan Bauer
Maya Beganovic
Oxcencis C
Danielle Candelario
Stephaney Cheng
Marie Cichon
Katie Connor
Margaret Cook
Kenton Cooksey
Anne Daniels
Xuan Ngoc (Mimi) Dao
Thomas Dilworth
Nicole Donovan
David Dulak
Katie Fermanich
Sommer Leigh Gay
Allison Gibble
Christopher Giuliano
Mickey Hart
Melissa Heim
Jennifer Hetzel
Katherine Higgins
Karlee Kamps
Kelsey Kapinus
Adrijana Kekic
Sarah Klemm
Jillian Kolasinski
Audrey Kostrzewa
Emily Leary
Molly Lehmann (Obermark)
Kajua Lor
Elizabeth Madrzyk
Arthur Margolis
Nate Menninga
Sam Miller
Eileen Murphy
Michael Nagy
Tuyet Nguyen
Zach Pape
Mary Frances Picone
Kelsey Powell
Mary Abigail Presto
Marcus Pribyl
Sarah Ray
Sara Reeb
David Reeb
Alicia Ritscher
Erin Robinson
Julia Schiefelbein-Egan
Natalie Schmitz
Rebecca Schoen
Trisha Seys Ranola
Mollie Shoyer
Melissa Smith
Ashley Storvick
Isabelle Sviatoslavsky
Christopher Thai
Kari Trapskin
Briah Trinh
Fitim Useini
Josh Vanderloo
Jenny Van Order
Brooke Ward
Natalie Weber
Madison Wiarek
Katie Willenborg
Loren-Ashley Williams
Nicholas Zupec

I am a Pharmacy Professional and a... Work Remotely

Jan/Feb 2021
Theme: **I am a Pharmacy Professional and I... am Part of a Pharmacy Family**

Email your response to mgrant@pswi.org by December 1.

Responses should be <100 words and include a photo.

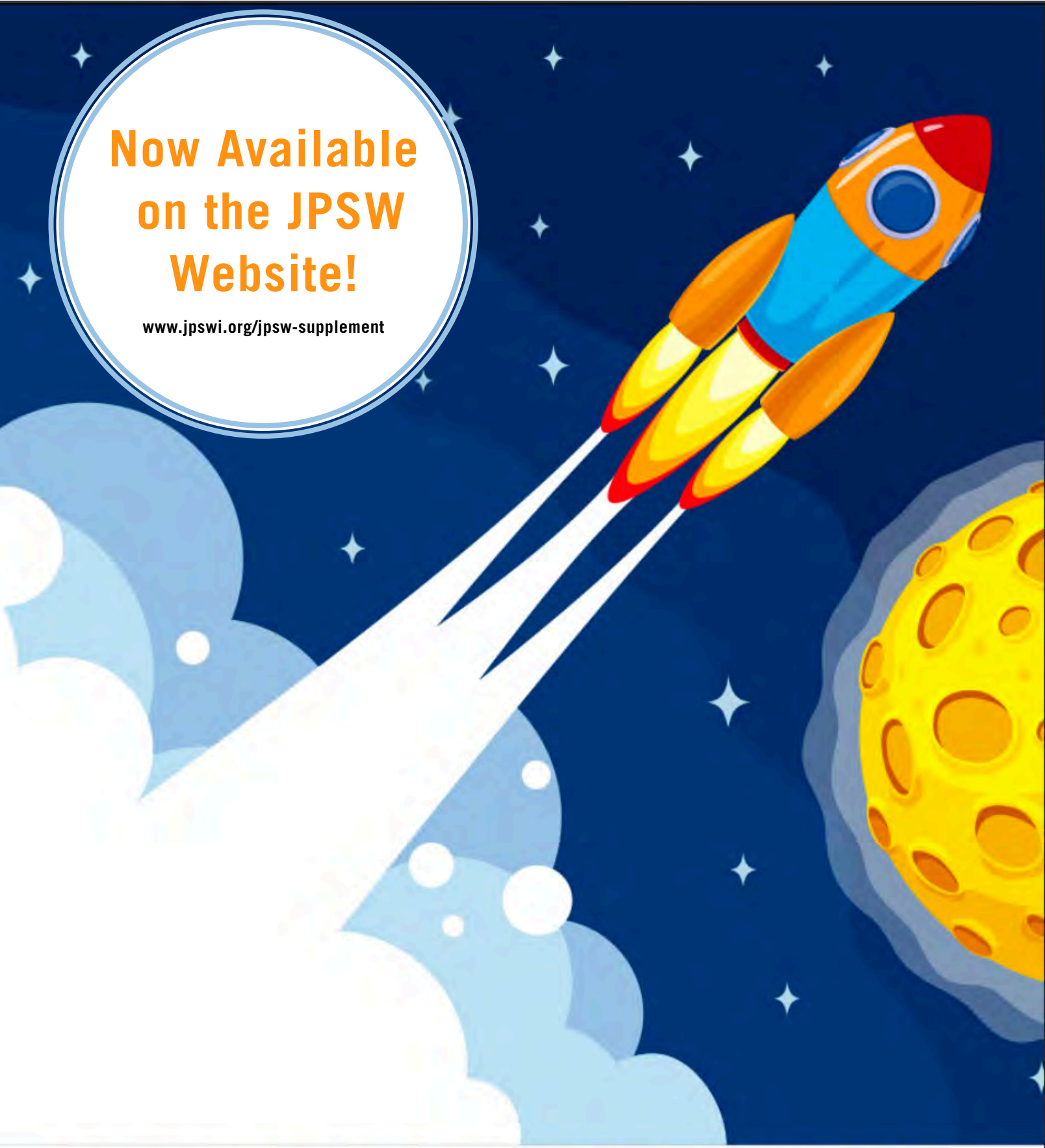
Rachel Kavanagh, PharmD, BCACP
Assistant Professor of Clinical Sciences
Medical College of Wisconsin School of Pharmacy, Milwaukee

Working remotely has taught me how to better balance my family and work lives, all while being a teacher in both roles. With two small kids at home and directing courses all summer, it has been a challenge knowing when I should teach my students or teach my kids, and when to plan for my next research project or plan for the next at home adventure. While we never really developed a routine during those crazy weeks, working remotely taught me that I can succeed in both realms by dividing my time into smaller pieces instead of huge chunks. For example, between conducting home-grown science experiments and constructing obstacle courses, I learned how to navigate multiple virtual platforms and transform hands-on skills instruction into distance learning applications. I learned I may not be a great kindergarten teacher, but I can roll dice to practice addition and subtraction. Despite being unable to provide as much immediate verbal feedback as I like, I can still help my students provide detailed recommendations through written feedback. Although challenging, working remotely has given me the opportunity change my outlook on teaching in different, but equally successful, ways.

Lynnae Mahaney, B.S., Pharm., MBA, FASHP
Director of Pharmacy Accreditation
American Society of Health-System Pharmacists

Working remotely is not new, as I've done this off and on since 2012. So the coronavirus did not cause cold-turkey virtual work! Here are a few things that have made my 'home' work life successful.

- A good view out the window all four seasons: sky, trees, flowers, leaves, snow, squirrels, a red fox, and an eagle now and then. This helps get through those short days of light in the Wisconsin winter.
- Speaking of light, lots of it. Dark is depressing and lonely and you don't need either of those given all the time you are working alone.
- Two large monitors. Do not skimp on simple, affordable technology to make your 'home' work life easier. It's hard enough to be on the computer all day and worse if you are trying to read, compare documents, and manage multiple websites and emails on one little laptop screen.
- Walk away from the keyboard. Yes, throw in a load of wash, take the dog out, or for that matter, take 'you' out for a walk. You would not sit at the computer eight straight hours if you were 'at work' and you are!
- Read something non-pharmacy at least once per day. Take breaks, in other words.
- Skype with colleagues. We all need the human connection.



2020 PSW ANNUAL MEETING

Poster Presentation Abstracts

PHARMACIST CE:

Review of Pharmacologic Contraceptive Options and Clinical Considerations for Use

by Shauna A. MacKenzie, 2021 PharmD Candidate, Marina L. Maes, PharmD, BCPS, BCACP

According to the most recently available data, nearly half of all pregnancies that have occurred in the United States (U.S.) are defined as unintended.[1] Unintended pregnancies include those pregnancies that are either unwanted or mistimed, and studies have found that children born from such circumstances are not only more likely to arrive prematurely, but they are also more likely to die within their first year of life.[2] Additionally, children of mothers with unintended pregnancies are more likely to suffer physical abuse, cigarette smoke exposure, substance abuse, and other forms of neglect when compared to those children born from mothers with timed and expected conception.[2] With higher instances of abuse and neglect, children of mothers with unintended pregnancies tend to rely more on social systems, such as welfare and social services, which can pose a societal strain and perpetuate multigenerational health disparities.

In response, the Office of Disease Prevention and Health listed decreasing the number of unintended pregnancies in the U.S. to be a national priority in 2010 when it compiled its Healthy People 2020 initiative.[3] The use of contraceptives, in particular hormonal contraceptives, is central to this task.[4,5] Despite this, many women still struggle with having adequate AZaccess to these necessary therapeutics.[6] In fact, recent surveys suggest that, of those women who have tried hormonal contraceptives at least once in their lifetime, at least 29% of them had trouble either obtaining an initial prescription or getting refills.[7] This was primarily due to lack of transportation, limited and inconvenient clinic hours, or lack of a clinic itself. In contrast, a very small percentage of women (4%) listed issues with having access to a pharmacy.

In an effort to increase access to hormonal contraceptives, multiple states have passed legislation to allow licensed pharmacists to autonomously prescribe some hormonal contraceptives. States where pharmacists currently have this prescriptive authority include California, Colorado, Hawaii, Idaho, Maryland, New Mexico, Oregon, Utah, and West Virginia, along with the District of Columbia.[8] It might be anticipated that other states will follow suit and pass similar legislation in the near future. As such, it is pivotal that practicing pharmacists feel comfortable stepping into this expanded role. In states where pharmacist contraceptive prescribing already occurs, a recent study found that most pharmacists felt comfortable with recall of contraceptive adverse effects and appropriate dosing regimens.[9] However, few pharmacists felt confident in their ability to find a contraceptive that is tailored to a specific patient's needs, taking into consideration a patient's medical conditions and prior adverse effects. In an attempt to decrease this knowledge gap

CE FOR **PHARMACISTS**

COMPLETE ARTICLE AND CE EXAM AVAILABLE ONLINE: **WWW.PSWI.ORG**

Learning Objectives

- Describe the two phases of the menstrual cycle including the key hormones involved
- Determine which prescription contraceptive options are safe for a specific patient utilizing the CDC Medical Eligibility Criteria chart
- Compare and contrast available prescription contraceptives taking into consideration route of administration, duration of action, effectiveness, and safety
- Apply knowledge regarding properties of estrogen and progestins to customize a patient's hormonal contraceptive regimen when adverse effects are experienced
- Identify serious adverse effects of hormonal contraception using the ACHES acronym

and increase pharmacist confidence in providing recommendations for initiation and modification of contraceptive therapy, this continuing education will provide a review of menstrual physiology, screening tactics to identify women eligible for hormonal contraceptive use, therapeutic considerations for different prescription contraceptive options, and strategies to address and mitigate adverse effects. Of note, emergency contraception and barrier methods (like condoms, diaphragm, cervical cap, and spermicides) are not discussed in this review but are important to consider when providing comprehensive contraception care for patients—it is recommended to review these topics on your own if a refresher is needed.

Menstrual Cycle Overview

A general knowledge of the physiology of the menstrual cycle and the hormones involved is required to understand the mechanism of action for the various contraceptive agents and to be able to appropriately modify and adjust contraceptive therapy when needed. The menstrual cycle duration is defined as the time between the first day of one period and the first day of the following period.[10] On average, the menstrual cycle is 28 days in length, but this will vary from woman to woman with a normal range of 21 to 40 days. Menstrual cycles that are shorter or longer than this range might be due to an underlying disorder, and women should be referred to their medical provider for further evaluation.

The menstrual cycle can be divided into two phases: the follicular (preovulatory) phase and the luteal (postovulatory) phase.[10] Ovulation occurs between these two phases and is typically around day 14 of the cycle. The follicular phase begins on the first day of the menstrual cycle and is characterized by rising levels of follicle stimulating hormone (FSH). This hormone is responsible for stimulating the growth of a group of ovarian follicles with ultimately one follicle becoming dominant. Ovarian follicles produce estradiol and progesterone, and estradiol promotes growth of the uterine endometrium in preparation for implantation. The sustained elevated levels of estradiol trigger the pituitary gland to release high levels of luteinizing hormone (LH), known as the LH surge. Luteinizing hormone is responsible for catalyzing the final steps of follicular maturation, rupture, and release of the oocyte. The ovulation process typically occurs shortly (10 to 16 hours) after the peak of the LH surge. As a result, conception is most likely to occur when intercourse takes place from two days prior to ovulation to the day of ovulation. After the follicle ruptures, it is called the corpus luteum, and the luteal phase has begun. The corpus luteum secretes progesterone and estradiol. Progesterone production during the luteal phase is essential for maintaining the endometrial lining should pregnancy occur. If fertilization and implantation do not occur, then the corpus luteum will degenerate, and progesterone and estradiol levels will decline. The decline in these hormones leads to shedding of the endometrial lining and a rise in FSH levels for the beginning of the next cycle.

TABLE 1. Risk categories from U.S. Medical Eligibility Criteria for Contraceptive Use

Category 1	No restriction (method can be used)
Category 2	Advantages generally outweigh risks (method can be used, but careful follow-up might be required).
Category 3	Risks generally outweigh the advantages. (method not recommended unless other more appropriate methods are not available or acceptable).
Category 4	Unacceptable health risk (method not to be used)

Table adapted from CDC U.S. MEC[17]

Health and History of Screening

Prior to initiating contraception, it is essential that an accurate past and present medical and medication history is obtained from the patient to assist in selecting contraception that will be safe and effective. The medication history should include prescription drugs, nonprescription drugs, herbals, and supplements. In states where pharmacist-prescribed birth control legislation is enacted, standard self-screening tools have been developed by state pharmacy associations to assist pharmacists with collecting pertinent information from a patient.[11-14] Patients should be asked about the presence or history of specific medical conditions that can be impacted by contraceptive drug therapy, including but not limited to: diabetes, migraine, hypertension, hyperlipidemia, cardiovascular (CV) disease, venous thromboembolism (VTE), tobacco use, cancer, liver disease, immunological disorders, seizures, human immunodeficiency virus, and other infections.[15] While not required prior to initiating or for continuing birth control, pharmacists should discuss the importance of routine women's health screenings at regular intervals and refer patients to other healthcare providers as needed. This includes pap smears, sexually transmitted infection testing, and breast examinations.[16] Pharmacists are also positioned to promote other preventative healthcare services, such as administration of human papillomavirus (HPV) vaccination.

Once an accurate past and present medical history is obtained, pharmacists should determine which contraceptive options a patient is medically eligible for. The Centers for Disease Control and Prevention (CDC) has published evidence-based guidance in this area in its "U.S. Medical Eligibility Criteria for Contraceptive Use" report.[17] This guidance document provides recommendations that focus on the safety of initiating or continuing six different types of contraceptive methods (copper intrauterine device [IUD], levonorgestrel IUD, implant, depot medroxyprogesterone acetate [DMPA], progestin-only pill [POP], and combined hormonal contraceptives [CHC]) based on the presence of certain medical conditions, characteristics, and concurrent medications. It is crucial that pharmacists are skilled in using and interpreting the CDC Medical Eligibility Criteria (MEC) as a tool to guide their clinical decision making with regard to contraceptives.

The MEC summary table includes medical conditions, patient characteristics,

TABLE 2. Summary of Contraceptive Options[10,19,24-25,28,30-35,39-43,48-49,52-53]

Contraceptive Category	Drugs	Dosing Considerations	Effectiveness		Clinical Pearls
			Typical Use	Perfect Use	
Non-Hormonal					
Copper IUD	Paragard®	• Needs to be inserted by clinician • Lasts up to 10 years	99.2%	>99%	• Heavy menstrual bleeding • Cost-effective in long-term • Patient counseling should include PAINS acronym
Progestin-Only					
Pill	Norethindrone Drospirenone	• Norethindrone has 3-hour window for missed dose • Drospirenone has 24-hour window for missed dose • No placebo pills	91-93%	>99%	• Common oral option used in breastfeeding women • Irregular menses and breakthrough bleeding common
IUD	Kyleena® Liletta® Mirena® Skyla® (all contain LNG)	• Need to be inserted by clinician • Kyleena® - lasts 5 years • Liletta® - lasts 6 years • Mirena® - lasts 5 years • Skyla® - lasts 3 years	>99%	>99%	• Lighter or reduced bleeding • Cost effective in long-term • Patient counseling should include PAINS acronym
Injection	Depo-Provera® (DMPA)	• Administered every 3 months IM or SQ » IM is clinician-administered only » SQ can be self-administered or clinician-administered • Duration of use should be limited to 2 years	93-94%	>99%	• More weight gain • Bone loss limits duration of use • Delayed return to fertility
Implant	Nexplanon® (ENG)	• Need to be inserted by clinician • Lasts 3 years	>99%	>99%	• Bleeding can be unpredictable—some women will have heavier bleeding and some will achieve amenorrhea
Combined Hormonal					
Pill	Many (consider estrogen and progestin components when assessing a specific product)	• Monophasic and multiphasic options • Extended use dosing is an option • Number of placebo pills can be variable (3 days or 7 days) depending on drug	91-93%	>99%	• Medication adherence is critical to prevent pregnancy • Given number of available products with varying hormone levels and progestin generation, can be more easily tailored to specific patient • Higher risk of thrombotic events • Important to assess medical eligibility prior to using CHC
Patch	Xulane® (norelgestromin+ EE) Twirla® (LNG+EE)	• New patch is applied weekly • Extended use dosing is an option • Application sites should be rotated	91-93%	>99%	• Higher systemic estrogen exposure • Contraindicated if BMI>30 kg/m2 • Important to assess medical eligibility prior to using CHC
Ring	NuvaRing® (ENG+EE) Annovera® (SGA+EE)	• Ring is kept in place for 3 continuous weeks and then removed • Each NuvaRing® system is for single use; Annovera® system can be used for 13 cycles	91-93%	>99%	• Avoid if history of toxic shock syndrome • Important to assess medical eligibility prior to using CHC

Abbreviations: IUD, intrauterine device; LNG, levonorgestrel; DMPA, depot medroxyprogesterone acetate; IM, intramuscular; SQ, subcutaneous; ENG, etonorgestrel; CHC, combined hormonal contraceptive; EE, ethinyl estradiol; SGA, segesterone acetate

and concurrent medications as rows and includes the six different types of contraceptive methods mentioned above as columns.[18] Within each method, there are two subheadings: I and C, where I represents initiation of the contraceptive method and C represents continuation of the contraceptive method. Each cell represents the intersection of a particular contraceptive option and a specific medical condition or characteristic, and is assigned to one of four categories (Table 1). Category 1 indicates that there are no restrictions to using the contraceptive method for that condition while category 4 indicates that the contraceptive method should be avoided for that condition due to unacceptable health risk. Categories 2 and 3 require more clinical judgment in weighing the benefits and risks and might require closer patient follow-up. For example, if we use the table to consider what options would be appropriate for a patient who experiences migraine with aura, we see that all contraceptive methods are assigned a category 1 except for combined hormonal contraceptives, which is assigned a category 4. The categories are the same for both initiation and continuation in this example. This indicates that an IUD, DMPA, implant, or POP would be safe to use, but CHCs, including combined oral contraceptives, vaginal ring, and patch, should be avoided.

It is important to note that this tool is intended to assess safety and does not address efficacy or patient preferences. Therefore, it is important to collect additional information to assist in tailoring a contraceptive regimen for an individual patient. For example, patients should be asked about their primary purpose for using contraception, as not all patients use contraception solely for preventing pregnancy. Clinicians should also determine whether a patient is sexually active, in order to provide appropriate patient education. Other pertinent information might include the patient's desired family planning, prior experiences with contraception (if any), and preference for dosage form.

Overview of Contraceptives and Therapeutic Considerations

In this section, we provide an overview of three types of prescription contraceptives—non-hormonal, progestin-only, and combined hormonal contraceptives—and the drugs that are included in each of these categories. Table 2 highlights key information for each. The medical eligibility category; patient preferences; and drug properties, including effectiveness, can be collectively evaluated to determine an ideal contraceptive option for a specific patient.

Non-Hormonal Contraceptives

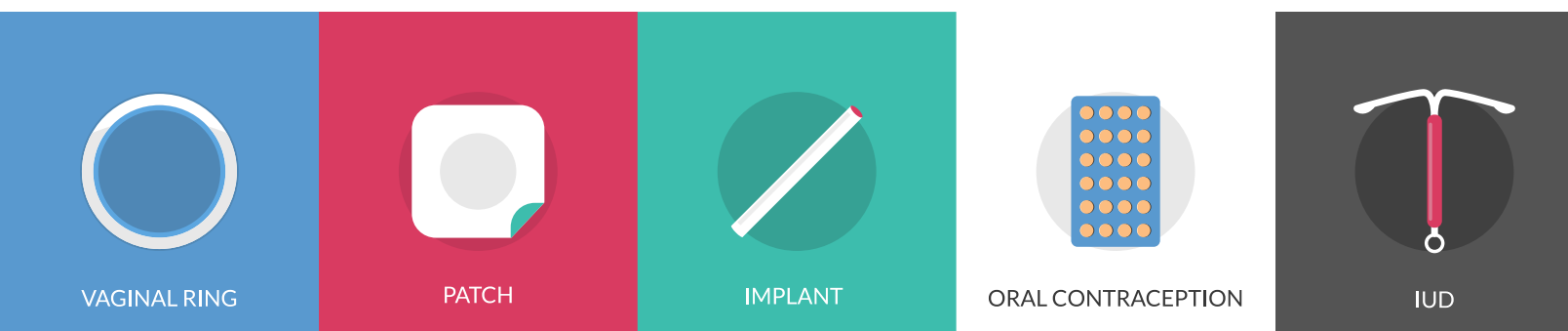
Copper Intrauterine Device - The copper IUD, Paragard®, is the only non-hormonal prescription contraceptive currently available in the U.S. It was the first IUD to come to market and can last up to 10 years once in place in the uterus.[19] The copper coil IUD achieves its contraceptive effects by acting as a foreign body in the uterus. It is also believed to inhibit fertilization through its toxic effects on sperm and the endometrial lining, and takes effect almost immediately after insertion.[20]

Due to its copper content, Paragard® might not be the best option for women who have Wilson's disease or other syndromes that impair absorption of elemental copper.[19] Women who use it are more likely to experience heavier menstruation and increased dysmenorrhea and thus the device might not be the best option for women with anemia or those who already have long periods and heavy menstrual flow. The copper IUD should be considered for women who prefer or need to avoid all hormonal contraceptive options. Adverse effects and monitoring considerations for all IUDs are further discussed in the levonorgestrel IUD section.

On-Demand Vaginal pH Regulator - The U.S. Food and Drug Administration (FDA) recently approved a contraceptive vaginal gel, Phexxi™, which contains lactic acid, citric acid, and potassium bitartrate. This product is anticipated to be available in the U.S. in the fall of 2020, along with a telemedicine support system to assist women with access to the product.[21] This contraceptive is intended to be used on demand and works by maintaining the acidic vaginal pH in the range of 3.5 to 4.5, which directly impacts sperm motility.[22] The recommended dosing is to administer 5 grams vaginally up to 1 hour prior to vaginal intercourse and is supplied as a single-use, pre-filled applicator. In an open-label, single-arm, multicenter trial, the 7-cycle pregnancy rate was 13.7% (101 pregnancies in 1,183 patients during 4,769 cycles).[22] This on-demand option appears to be less effective than other contraceptive methods, and its place in therapy is currently unknown. However, it might be a desirable non-hormonal option for women who might not have otherwise used contraception.

Progestin-Only Contraceptives

Progestins act as contraceptives via multiple mechanisms of action. The primary mechanism of action is to prevent or delay ovulation via inhibition of LH release from the pituitary gland.[10] This is accomplished by negative feedback from excess progestin levels. With blunted levels of LH, the surge in LH that usually causes ovulation is either absent or delayed. In the case of delayed ovulation, it is thought that this would cause a mistiming with



when viable sperm would be available for conception. Secondary mechanisms of action include thickening of the cervical mucus, atrophy of the endometrium, and decreased motility of an ovum in fallopian tubes, all of which make it harder for ovulation or proper fertilization to occur.

Contraceptives consisting solely of progestins are available as pills (norethindrone, drospirenone), IUDs (levonorgestrel), implant (etonogestrel), and injection (medroxyprogesterone acetate). Both the IUDs and the implant available are commonly referred to as LARCs (long acting reversible contraceptives). In general, progestin-only contraceptives are good options for women who need to avoid estrogen (e.g., because they are breastfeeding, have a history of VTE, or have a high CV risk). They are also preferred when a patient desires a long-acting reversible option.

Progestin-Only Pills (POPs) - Pills that contain only progestin are often referred to as "mini-pills" or POPs. Until June 2019, the only approved POP in the U.S. was norethindrone. The norethindrone-containing POP should be taken once daily and must be taken as close as possible to the same time each day in order to ensure efficacy. If a dose is taken even three hours from its usual time, it is considered a missed dose and a back-up method (such as a barrier method) should be used for the next 48 hours to prevent pregnancy.[23,24] It is important that women are informed that there is no placebo or "sugar pill" week with this option; the contraceptive is taken continuously. In 2019, the FDA approved a new progestin-only oral option containing drospirenone.[25] This new POP is the first and only POP with a 24-hour missed-pill window, which is in contrast to the norethindrone-containing POP. The drospirenone-containing POP is supplied as a 28-day pack with 24 days of active tablets and four days of placebo. In general, POPs might be considered for women who cannot take estrogen. POPs are commonly used in the postpartum period by breastfeeding women, because they have been shown to have a positive or neutral effect on lactation, in contrast to estrogens.[26] There is no delay in return to fertility with POPs, which is in contrast to other progestin-only options discussed later. This might be due in part to the fact that an estimated 40% of women still experience ovulation while on POPs. In this case, the secondary effects of the progestins are thought to contribute to a greater degree of contraceptive effectiveness.[23,27] However, the combination of continued ovulation with decreased fallopian motility caused by progestin creates higher risks for ectopic pregnancy.

Injection - The injectable form of progestin, also known as Depo-Provera® or DMPA, consists of crystalline medroxyprogesterone acetate in an aqueous suspension and is available in 150 mg/mL strength in either vials or prefilled syringes.[28] The injection can be administered intramuscularly or subcutaneously. The intramuscular option must be administered in a clinic setting, whereas the subcutaneous option can be administered in the clinic or self-administered by the patient at home. The DMPA injection ideally should be given within the first 5 to 7 days of a woman's menstrual period. If given outside of this time frame, a reliable form of back-up contraception should be used for the first week after the injection is given. One dose lasts 13 weeks (3 months) and does not need to be adjusted for weight, making it a good option for women who are considered overweight or obese. If a woman misses one of her injections, there is a two-week "grace period" in which no back-up contraception is needed. Long-term use of DMPA, defined as two years or longer, is warned against in the package labeling, due to a propensity for it to cause hypoestrogenism, which can lead to loss in bone mineral density. The manufacturer warns that such bone loss might not be completely reversible and that DMPA should only be used long-term when other contraceptive options cannot be considered. Furthermore, DMPA causes a prolonged delay in return to fertility following cessation of its use. On average, return to fertility can take anywhere from 14 weeks to 22 months.[23,29] As such, DMPA might not be a good option for women trying to conceive in the near future, as well as those with a history of bone-related comorbidities or fractures. However, the DMPA injection might be preferred for women who do not want to take a medication daily and wish to avoid more invasive options like the implant or the IUD discussed later.

Implant - The progestin implant is a small, flexible rod containing etonogestrel that is inserted subdermally by a specially trained clinician into the inner side of the non-dominant upper arm. The Nexplanon® implant is designed to release etonogestrel over a period of three years.[30] Of note, Nexplanon® has replaced an older version of the implant, Implanon®. This newer version of the implant contains barium sulfate so that it can be located by imaging if displaced.

The timing of implant insertion depends on the woman's recent contraceptive history, and the package insert should be reviewed for more specific details on this topic.[30] Once inserted, the patient should be able to feel the implant in the arm at all times. Patients should be counseled that, if at any point they can no longer feel the implant, they need to contact their provider, because there is a chance that the implant might have migrated or been improperly placed, increasing risk for pregnancy to occur. The implant has not been studied in women whose weight is greater than 130% of their ideal body weight and thus might not be the best option for those who are overweight or obese. In regard to return of fertility after implant removal, most women are able to become pregnant within the year following the device's removal.

Women who struggle to adhere to pills, rings, or patches might benefit from using the implant if they can tolerate the insertion process. One of the most common side effects seen is change in menstrual bleeding, which could include either amenorrhea or increased flow.[30] Overall, most women experienced infrequent bleeding, defined as less than three bleeding or spotting episodes over a 90-day time period. However, bleeding that was prolonged, defined as lasting 14 days or more over a 90-day time period, was also fairly common. It is suggested that whatever changes a woman experiences within the first 90 days of use of Nexplanon® will predict what she will see for the duration of use.

Intrauterine Devices (IUDs) - The four levonorgestrel-containing IUDs are

Kyleena®, Liletta®, Mirena®, and Skyla® and were designed to help reduce heavy menstrual bleeding that is observed with Paragard® users.[23, 31-34] While all four of the hormonal IUDs share the same active ingredient, they do vary slightly in their suggested population of use, length of duration, and concentration of hormone released.[35]

It is best to consider desired duration of action, potential for systemic side effects, and cost/insurance coverage when helping a patient decide which IUD is best for them. The duration of use ranges from 3 years (Skyla®) to 6 years (Liletta®) and the amount of hormone released per day is variable, with Skyla® having the lowest amount of hormone released per day and Mirena® and Liletta® having the greatest amount of hormone released per day.[31-34] For women with barriers to accessing IUDs due to cost, it might be worth considering patient-assistance programs. For Liletta® in particular, the manufacturer has partnered with Medicines360, a nonprofit pharmaceutical company, to provide the IUD at a more affordable cost.[36]

One important consideration for all IUDs is that a trained clinician must insert the device, which could mean higher up-front costs for their use. However, it has been demonstrated that IUDs are the most cost-effective hormonal contraceptive for use over time.[37] Once an IUD is inserted, women should be re-evaluated in four to six weeks to ensure the IUD is properly placed.[31-34] Women should also be educated on warning signs that should prompt medical attention. Warning signs can be recalled by the "PAINS" acronym: Period is late; Abdominal pain or pain with intercourse; Infection, abnormal or odorous vaginal discharge; Not feeling well, fevers, chills; String missing, shortened or longer.[35] If any of these signs or symptoms are present, they necessitate a referral to a provider. There is no significant delay in fertility seen following removal of an IUD.[10,35]

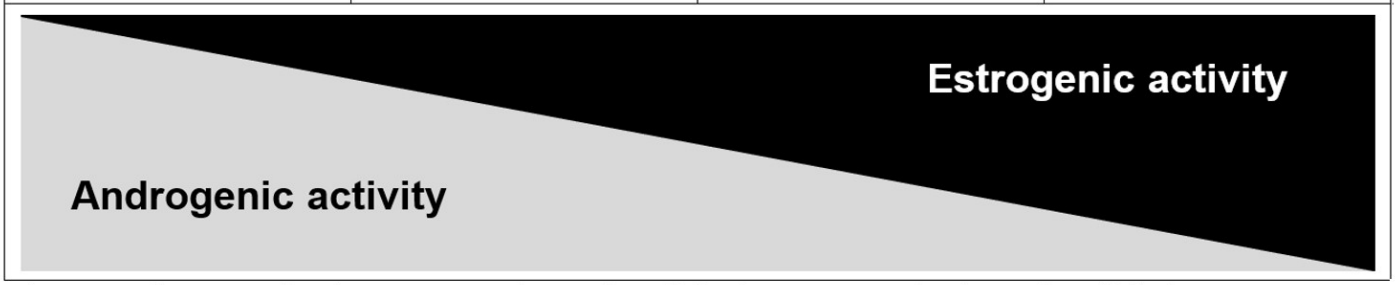
IUDs are a good option for women who desire a highly effective and long-acting contraceptive, but struggle with routine adherence to a pill, patch, or ring contraceptive regimen. Additionally, IUDs might be preferred for women who have barriers to accessing a pharmacy to obtain refills.

Combined Hormonal Contraceptives

Combined hormonal contraceptives (CHCs) have a synthetic estrogen component in addition to a progestin component. In the U.S., ethinyl estradiol (EE), mestranol, and estradiol valerate are the three estrogens used, with EE being the most commonly seen in combination contraceptives.[35,38] Ethinyl estradiol doses range from 10 to 50 mcg depending on the combined contraceptive with typical doses in the range of 20 to 35 mcg.[10] There are currently eleven synthetic progestins used in contraceptives in the U.S.. They are categorized according to generation, ranging from first generation to fourth generation. As generation increases, androgenic properties decrease, and estrogenic properties increase (Figure 1). This is important to consider as it can impact effects of the contraceptive beyond pregnancy prevention. For example, patients with acne or hirsutism would benefit from a contraceptive with less androgenic properties. In this case, a third or fourth generation progestin would be preferred over a first or second generation progestin. Of note, drospirenone actually displays antiandrogenic properties as well as antimineralocorticoid effects, which can be helpful for women who experience side effects like bloating as a result of excess estrogen. The progestin component in combined hormonal contraceptives exerts the same mechanism of action as it does in progestin-only options. The estrogen component also contributes through negative feedback on FSH levels, which over time hinders normal follicle development to further impede ovulation and halt formation of the corpus luteum.[27] The sex hormone-binding globulin (SHBG), which binds free androgens in the body, is also increased by estrogen, which might be one reason some CHC formulations have indications for acne and hirsutism treatment.[4] Estrogen can also

FIGURE 1. Progestin Generations[10,35,40]

1st Generation	2nd Generation	3rd Generation	4th Generation
Norethindrone	Levonorgestrel	Desogestrel	Drospirenone
Norethindrone acetate	Norgestrel	Etonogestrel	Dienogest
Ethynodiol diacetate		Norgestimate	
		Norelgestromin	



As progestin generation increases, androgrenic activity decreases and estrogenic activity increases.

TABLE 3. Therapy Modifications for Combined Oral Contraceptives Based on Adverse Effects[10,35,40,56]

Adverse Effect	*Reason*	*Therapy Modification*
Early breakthrough bleeding (first half of cycle)	Insufficient estrogen	Increase estrogenic activity
Late breakthrough bleeding (second half of cycle)	Insufficient progestin	Increase progestin
Nausea/vomiting	Excess estrogen	Decrease estrogenic activity
Cyclical weight gain		
Bloating		
Fluid retention		
Breast tenderness		
Headache		
Acne, oily skin	Excess progestin*	Decrease androgenic activity
Hirsutism		
Depression	Excess progestin	Decrease progestin
Non-cyclical weight gain		

**Indicates androgen excess specifically*

help to prevent breakthrough bleeding that occurs early on in the cycle.

One of the most important factors when considering use of a CHC is to assess risk associated with exogenous estrogen use. This is where the MEC chart from the CDC can be extremely valuable. Combined hormonal contraceptives were originally developed as pills but are now available in other dosage forms, including an intravaginal ring and transdermal patch. Of note, seven days of back-up contraception are needed if it has been more than five days since the patient's last menses at the time of CHC initiation.[39]

Combined Oral Contraceptives - We cannot cover all available combined oral contraceptives (COCs) in this review, but a foundational understanding of the estrogen and progestin components that make up the various combined OCs can help in clinical decision-making. Most COCs contain 21 days of active pills and seven days of inactive or placebo pills; however, some pill packs offer 24 days of active pills and only four days of placebo in order to reduce hormone withdrawal and menses duration. Some formulations might contain iron in the hormone-free week, which might be helpful for iron-deficiency anemia. There is also a chewable form of combined OC available that can be used if a woman has trouble swallowing pills.

COCs are available in monophasic or multiphasic dosing regimens. With multiphasic (biphasic, triphasic, quadriphasic) formulations, the hormone levels in each pill fluctuate according to which week of the pill pack the patient is taking.[40] In contrast, monophasic formulations have consistent hormone levels throughout the month. Biphasic options contain two phases of varying hormone levels. Triphasic formulations include varying doses in each of the three weeks of hormonal tablets. Typically, the progestin dose increases with each week. However, estrophasic formulations are now available, where the estrogen level increases instead. Quadriphasic regimens are the newest formulations of COCs and have changing levels of both estrogen and progestin throughout the cycle.[41-43] Multiphasic options are marketed as being more physiologically similar to a woman's natural hormones during a menstrual cycle and are therefore thought to decrease adverse effects and improve cycle control. However, in two 2011 Cochrane reviews, there was insufficient evidence to conclude that multiphasic options improve effectiveness, discontinuation rates, or bleeding patterns.[44,45] Because of a lack of evidence suggesting a benefit of multiphasic options over monophasic options, it is suggested to start with a monophasic formulation in women who are initiating COCs.

As a pharmacist, it is important to note which COCs can be taken in an "extended-use" manner. An extended-use regimen is where a patient takes active hormonal contraception continuously beyond 21 days without a hormone-free interval.[40] For example, a woman could take the active tablets of a COC daily for 3 months followed by a 7-day hormone-free interval. This option might be preferred by women who desire to reduce the number of menstrual periods and the adverse effects secondary to estrogen withdrawal. There are some COCs that are specifically supplied in an extended-use regimen (i.e., contain 84 active tablets and 7 placebo tablets). Monophasic combined OCs can also be used in an extended-use manner by skipping the placebo pills and beginning the next pack. Extended-use dosing should be avoided with multiphasic formulations because of the fluctuating levels of estrogen and progestin, as this could lead to adverse effects. Of note, risk of breakthrough bleeding might be higher with extended-

use dosing for the first 3 to 6 cycles, but this decreases over time.[46] When starting a COC, there are 3 initiation methods that can be considered.[40] One is the "Sunday method," in which the woman begins the first pill in the pack on the Sunday following her most recent menses. There is also the "first day" or "same day" start, in which the woman simply starts the COC on the first day of her menses cycle. Finally, there is the "quick start," where the woman takes the first dose of the COC in the prescriber's office or as soon as she picks up the medication from the pharmacy.[47] Regardless of the method chosen, it is recommended that a back-up contraceptive be used for the first 7 days after starting an oral contraceptive if it has been more than 5 days since the start of menses. If it has been less than 5 days since the start of menses, backup contraception is not warranted.[39]

One of the major issues with oral contraceptives is adherence, with women frequently forgetting doses, being late to take doses, or missing doses due to sickness such as vomiting or diarrhea. It is important that women be counseled on what to do should a missed dose occur. If one tablet is missed or late, the woman should take the missed dose as soon as possible, which might mean taking two pills in one day, and then continue the pack as normal afterwards.[40] No back-up contraceptive is needed. If two or more consecutive tablets are missed, the woman should take one of the missed tablets and then discard the rest that were forgotten. She should then continue the rest of the pack as scheduled and use a back-up method for 7 days. If the missed dose occurs in the last week of a pill pack, she should finish the rest of the active tablets, omit the hormonal free interval of the pack and begin a new pack altogether. If at any point in a pack cycle, she misses two or more pills and has unprotected sexual intercourse within 5 days of forgetting a pill, she should consider emergency contraception. It is important to note that missed doses for progestin-only pills are handled differently (refer to progestin-only pill section above). If routine difficulty with adherence is a concern, other contraceptive options discussed in this review should be considered.

Pharmacists can play a key role in assisting women in selecting a COC, either directly (in states where pharmacist-prescribed birth control is allowed) or indirectly (by working with the woman's prescriber). The number of available COCs can be overwhelming, but a general starting place for selecting a COC is to choose a monophasic option that includes 20-30 mcg of ethinyl estradiol and a second-generation progestin like levonorgestrel. Pharmacists can then use their knowledge of the estrogen and progestin components in COCs along with patient preferences to tailor the regimen to that specific patient. For example, a patient who desires acne control might be initiated on a COC that includes a fourth generation progestin instead. Once the initial therapy has been chosen, it is possible that the woman will experience side effects from the COC, and she should be counseled accordingly. The management of adverse effects is discussed in greater detail in a later section.

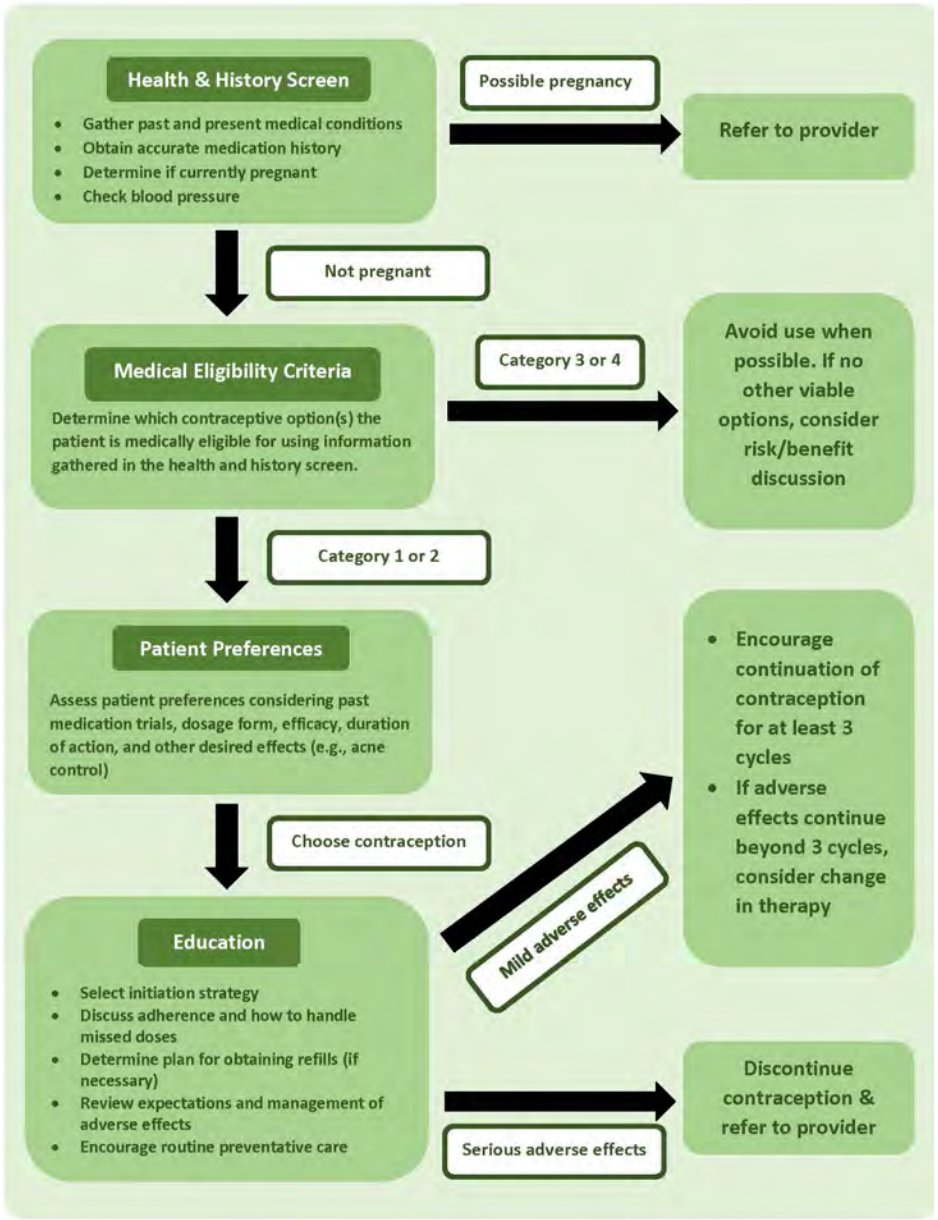
Transdermal Contraceptive Patches - There are two brands of transdermal contraceptive patches available for use currently: Xulane®, which contains 6 mg of norelgestromin and 0.75 mg of EE; and Twirla®, which contains 2.6 mg of levonorgestrel and 2.3 mg of EE.[48,49] The transdermal patch works the same way as COCs to prevent pregnancy; however, they might be more convenient for women who find daily adherence to a medication challenging. During a single 4-week cycle, a new patch is applied to the upper outer arm, abdomen, buttock, or back at the start of each week, during weeks 1-3. The previous week's patch is also removed at the beginning of these weeks and thrown away with the two adhesive sides put together. For week 4 of the cycle, the patient has a 1-week hormone-free interval during which no patch is worn. Patches can be kept on while swimming and showering, but should never be cut, damaged, or exposed to extreme heat.

The same methods for initiation of oral contraceptives apply to the transdermal patches. If a woman is switching from an oral contraceptive to the patch, she should finish her most recent pack of pills, wait for the 7-day withdrawal period to occur, and then begin the first patch on the day when she would normally begin her next pill pack.[48,49] No back-up contraception is needed if the patch is started within 7 days of stopping the pill.

When applying the patch, the upper outer arm, abdomen, buttock, or back can be used, and sites should be rotated weekly in order to avoid irritation. Women should be counseled to check the patch every day in order to ensure all the edges are still adhered to the skin. If the patch for some reason falls off, no back-up contraceptive is needed unless it is off for longer than 1 day, in which case back-up would be needed for a period of at least 7 days. If the patient forgets to remove a patch, the specific action that needs to be taken will depend on which week of the cycle it is. Pharmacists can refer to the package insert to provide education should this occur. The patch can be used in an extended-use fashion similar to the COC. Instead of the 7-day hormone-free interval during which the patch would be off, the patient could immediately apply the next patch. A common approach is for the patient to continue applying a new patch weekly for 12 weeks, followed by a 1-week hormone-free interval for menses to occur. However, other regimens have also been studied and well-tolerated.[50]

Women with a body mass index (BMI) greater than 30 kg/m^2 and women with venous thromboembolism (VTE) risk factors should generally avoid the patch as a first option. Both patches are only approved for women with BMI less than 30 kg/m^2 due to the possibility of altered pharmacokinetics and decreased efficacy in this population. Of note, a 2016 Cochrane Review was conducted that evaluated the efficacy of hormonal contraceptives in overweight and obese women and did not find an association between effectiveness of hormonal contraceptives and BMI or weight.[51] However, the quality of the studies that included the patch were considered to be low or very low. Of note, package labeling for contraceptive patches includes a warning stating that women who use the patch might be exposed to 60% greater estrogen levels than what is seen with combined COC use, potentially increasing risk for VTE.[48,49] If other contraceptive options are not available or appropriate for a patient with the aforementioned characteristics, then the

FIGURE 2. General Process for Initiating Contraception



contraceptive patch could be considered with discussion of risks and benefits.

Intravaginal Contraceptive Rings - NuvaRing® and Annovera® are the two intravaginal contraceptive ring systems available for use, both containing a progestin and estrogen component.[52,53] The NuvaRing® system is a colorless ring containing etonogestrel and EE, while Annovera® is an opaque white ring containing segesterone acetate and EE. Of note, neither ring contains latex.

Regardless of whether NuvaRing® or Annovera® is used, one ring is meant to be placed into the vagina and remain there for a continuous 3-week time period.[52,53] At the end of the third week of use, the ring is removed by hooking the index finger under the rim of the ring, grasping firmly with both the index and middle finger and pulling. This is then followed by a ring-free week during which bleeding occurs due to hormone withdrawal. Following the 7-day hormone-free interval, the woman is ready for the next 3-week cycle of use. It is important that, each month, the ring is inserted on the same day of the week and around the same time of the day as the last ring was inserted. This helps maintain more consistent drug levels in the body to reduce risk of pregnancy.

Each NuvaRing® is for single use and should be disposed of after each month.[52] In contrast, Annovera® is a reusable ring, and after week 3 of each cycle can be washed with mild soap and water, patted dry, and then kept in its case during the ring-free period.[53] When it is time to start a new cycle, the Annovera® ring should be once again cleaned prior to insertion. Annovera® is designed to last for thirteen 28-day cycles, which is equivalent to one year of use. Since Annovera® is reusable, it does not require routine access to a pharmacy for refills, making it a potentially good option for those women who live in rural areas or who frequently travel. It also might be an ideal option for those women who wish to use a contraceptive method that allows them to reduce their impact on the environment. Both intravaginal ring options might be preferred for women who wish to avoid taking a medication daily and wish to avoid LARCs like the IUD and implant. Of note, Annovera® is a new, branded product which is important to consider from a cost perspective. Extended-use dosing has been studied with NuvaRing®, but not with the Annovera® ring.[54] If extended-use dosing is used with NuvaRing®, the patient would insert a ring that is then left in place for 3 weeks. After 3 weeks, the ring is removed, and a new ring is inserted. The hormone-free interval is skipped.

If a woman is not on hormonal contraception prior to beginning NuvaRing®, it is ideal to insert the ring on the first day of her most recent menses. It is okay to begin using the ring after day one of menses, however a reliable form of back-up contraceptive should be used for 7 days.[52] When starting on Annovera®, it is recommended the ring be inserted anywhere between days 2 and 5 of menses and back-up only used if insertion occurs outside of this range.[53] Accidental expulsion of either ring might occur during the 3-week cycle and the package insert should be reviewed for how to counsel a patient on how to manage if this occurs.

There have been some studies that suggest the risk of toxic shock syndrome (TSS) with use of an intravaginal contraceptive system; thus, women with a history of TSS might want to

consider other options.[52,53] Neither ring is compatible with douching; however, spermicides, tampons, and antifungal creams can be used concomitantly. Due to the nature of insertion, women who are prone to vaginal irritation or tears might not be good candidates for transdermal ring systems. NuvaRing® should be kept in a refrigerator prior to dispensing to the patient[52] but can be kept at room temperature afterwards for up to 4 months.[55] Annovera®, on the other hand, should always be stored at room temperature.[53]

Management of Adverse Effects

Discontinuation of contraception is common, and adverse effects have been the most commonly reported reason for discontinuation.[55] Pharmacists can play a key role in providing appropriate counseling to women regarding adverse effects when contraception is initiated. Furthermore, pharmacists can provide recommendations for how to appropriately adjust contraception after identifying and assessing adverse effects that women experience while on contraception.

When contraception is initiated, patients should be informed about what adverse effects would be considered serious and require drug discontinuation. A common acronym that can be used to remember serious adverse effects for hormonal contraception is ACHES: abdominal pain, chest pain, headaches (severe), eye problems, and severe leg pain.[35] If a patient is experiencing any of these symptoms, she should stop contraception immediately and seek medical attention, as these symptoms could be indicative of a thrombotic event like myocardial infarction, stroke, pulmonary embolism, or deep vein thrombosis.

Common side effects include headache, nausea, vomiting, breakthrough bleeding or spotting, bloating, weight gain, and mood changes. Upon initiation of a contraceptive, women should be counseled that it can take 2 to 3 cycles for their bodies to adjust to the new drug.[35] Many side effects occur early and then dissipate with continued use. Therefore, it is recommended that no changes are made to the contraceptive regimen for at least 2 to 3 months after it is initiated, or a new change is made (unless a serious adverse effect occurs that requires immediate discontinuation).

Adverse effects that occur beyond the adjustment period can usually be attributed to an excess or insufficiency of the estrogen or progestin activity in the current contraceptive. Table 3 summarizes some common adverse effects and how to adjust the estrogen or progestin activity to mitigate the adverse effect. Estrogenic activity can be modified by either changing the dose of the estradiol component or by switching the progestin component to a different generation progestin (Figure 1). Similarly, if the progestin component needs to be modified, both the dose and the androgenicity of the progestin should be considered.

Conclusion

Access to and appropriate use of contraception is critical for prevention of unintended pregnancies. Given the number of available contraceptive options, each with its own unique considerations, pharmacists can play a key role in ensuring safe and effective use of contraception. Figure 2 outlines a general process for pharmacists to consider when prescribing contraception and/or providing recommendations to another healthcare provider who is prescribing contraception. As pharmacists are the most accessible healthcare providers and pharmacist-driven services continue to expand, it is essential that we are confident in our ability to provide women with high-quality care in regard to contraceptive use.

Shauna MacKenzie is a 4th Year Doctor of Pharmacy Candidate at the University of Wisconsin-Madison School of Pharmacy in Madison, WI. Marina Maes is an Assistant Professor at the University of Wisconsin-Madison School of Pharmacy in Madison, WI.

Disclosure: The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

References

1. Finer LB, Zolna MR. Declines in unintended pregnancy in the United States, 2008-2011. *N Engl J Med*. 2016;374(9)843-852. doi:10.1056/NEJMsa1506575
2. Brown SS, Eisenberg L, eds; Institute of Medicine (US) Committee on Unintended Pregnancy. The Best Intentions: Unintended Pregnancy and the Well Being of Children and Families. National Academies Press; 1995. Accessed August 1, 2020. doi:10.17226/4903
3. US Department of Health and Human Services. Healthy people 2010 final review. 2012. Accessed August 1, 2020. https://www.cdc.gov/nchs/data/hpdata2010/hp2010_final_review.pdf
4. Huber JC, Bentz EK, Ott J, Tempfer CB. Non-contraceptive benefits of oral contraceptives. *Expert Opin Pharmacother.* 2008;9(13):2317–2325. doi:10.1517/14656566.9.13.2317
5. Pearlstein TB, Bachmann GA, Zacur HA, Yonkers KA. Treatment of premenstrual dysphoric disorder with a new drospirenone-containing oral contraceptive formulation. *Contraception.* 2005;72(6):414–421. doi:10.1016/j.contraception.2005.08.021
6. Committee on Gynecologic Practice. Over-the-counter access to hormonal contraception: ACOG committee opinion, number 788. *Am J Obstet Gynecol.* 2019;134(4):e96-e105. doi:10.1097/AOG.0000000000003473
7. Grindlay K, Grossman D. Prescription birth control access among U.S. women at risk of unintended pregnancy. *J Women's Health* (Larchmt). 2016;25(3):249-254. doi:10.1089/jwh.2015.5312
8. Kooner M, Joseph H, Griffin B, et al. Hormonal contraception prescribing by pharmacists: 2019 update. *J Am Pharm Assoc* (2003). 2020;S1544-3191(20)30020-0. doi:10.1016/j.japh.2020.01.015
9. Lio I, Remines J, Nadpara PA, Good JKR. Pharmacists' comfort level and knowledge about prescribing hormonal contraception in a supermarket chain pharmacy. *J Am Pharm Assoc* (2003). 2018;58(4S):S89-S93. doi: 10.1016/j.japh.2018.05.005
10. El-Ibiary SY, Shrader SP, Ragucci KR. Chapter 18: Contraception. Pharmacotherapy: A Pathophysiologic Approach. 11th ed. McGraw-Hill Education; 2020.
11. California State Board of Pharmacy. Self-administered contraception protocol information. Patient self-screening tool-English. Accessed August 1, 2020. https://www.pharmacy.ca.gov/publications/patient_screening_tool_consumers_english.pdf
12. Colorado Pharmacists Society. Hormonal contraceptive self-screening questionnaire. Updated November 2016. Accessed August 1, 2020. https://www.copharm.org/assets/Self-ScreeningRiskAssessmentQuestionnaire.pdf
13. Tennessee pharmacist-provided hormonal contraceptives self-screening questionnaire. Accessed August 1, 2020. https://www.tn.gov/content/dam/tn/health/healthprofboards/pharmacy/TNSelfScreeningQuestionnaire_01172017.pdf
14. Utah hormonal contraceptive self-screening questionnaire. Accessed August 1, 2020. https://dopl.utah.gov/pharm/hormonal_contraception_questionnaire.pdf
15. Grossman D, Fernandez L, Hopkins K, Amastae J, Garcia S, Potter J. Accuracy of self-screening for contraindications to combined oral

contraceptive use. *Obstet Gynecol.* 2008;112(3):572-578. doi: 10.1097/AOG.0b013e31818345f0
16. Women's Preventive Services Initiative. Recommendations for well-woman care—a well-woman chart. 2018. Accessed August 1, 2020. https://www.womenspreventivehealth.org/wp-content/uploads/WellWomanChart.pdf
17. Curtis K, Tepper N, Jataloui T, et al. U.S. medical eligibility criteria for contraceptive use, 2016. *MMWR Recomm Rep.* 2016;65(3):1-104. doi:10.15585/mmwr.rr6503a1
18. Centers for Disease Control and Prevention. Summary chart of U.S. medical eligibility criteria for contraceptive use. 2016. Accessed August 1, 2020. https://www.cdc.gov/reproductivehealth/contraception/pdf/summary-chart-us-medical-eligibility-criteria_508tagged.pdf
19. Paragard. Package insert. CooperSurgical, Inc; 2020.
20. Wertheimer RE. Emergency postcoital contraception. *Am Fam Physician.* 2000;62(10):2287-2292.
21. Franki L. FDA approves Phexxi for use as on-demand contraceptive. Medscape. May 26, 2020. Accessed August 1, 2020. https://www.medscape.com/viewarticle/931149
22. Phexxi. Package insert. Evofem Biosciences, Inc; 2020.
23. Erkkola R, Landgren BM. Role of progestins in contraception. A*cta Obstet Gynecol Scand.* 2005;84(3):207–216. doi:10.1111/j.0001-6349.2005.00759.x
24. Ortho Micronor. Package insert. Ortho-McNeil Pharmaceutical, Inc; 2008.
25. Slynd. Package insert. Exeltis USA, Inc; 2019.
26. Truitt ST, Fraser AB, Grimes DA, Gallo MF, Schulz KF. Hormonal contraception during lactation. systematic review of randomized controlled trials. *Contraception*. 2003;68(4):233–238. doi:10.1016/s0010-7824(03)00133-1
27. Rivera R, Yacobson I, Grimes D. The mechanism of action of hormonal contraceptives and intrauterine contraceptive devices. *Am J Obstet Gynecol.* 1999;181(5 pt 1):1263–1269. doi:10.1016/s0002-9378(99)70120-1
28. Depo-Provera. Package insert. Pfizer Inc.; 2010.
29. Tolaymat LL, Kaunitz AM. Long-acting contraceptives in adolescents. *Curr Opin Obstet Gynecol.* 2007;19(5):453–460. doi:10.1097/GCO.0b013e3282ef1cd2
30. Nexplanon. Package insert. Merck & Co., Inc; 2019.
31. Mirena. Package insert. Bayer HealthCare Pharmaceuticals Inc; 2009.
32. Kyleena. Package insert. Bayer HealthCare Pharmaceuticals Inc; 2016.
33. Liletta. Package insert. Allergan and Medicines360; 2018.
34. Skyla. Package insert. Bayer HealthCare Pharmaceuticals Inc; 2017.
35. Hatcher RA, Trussell J, Nelson AL, et al. Contraceptive Technology. 21st ed. Managing *Contraception,* LLC; 2018.
36. How can I get Liletta? Liletta website. Accessed August 1, 2020. https://www.liletta.com/how-can-I-get-Liletta
37. Trussell J, Lalla AM, Doan QV, Reyes E, Pinto L, Gricar J. Cost effectiveness of contraceptives in the United States. *Contraception.* 2009;79(1):5-14. doi:10.1016/j.contraception.2008.08.003
38. Dickey RP. Managing Contraceptive Pill Patients. 15th ed. EMIS Inc; 2014.
39. Center for Disease Control and Prevention. U.S. Selected Recommendations for Contraceptive Use, 2013. *MMWR* 2013;62(No. RR-62):1-60.
40. Mitchell JS, El-Ibiary SY, Downing D. Chapter 14: Hormonal and emergency contraception. Women's Health Across the Lifespan. 2nd ed. McGraw-Hill Education; 2019.
41. Natazia. Package insert. Bayer Healthcare Pharmaceuticals, Inc; 2015.
42. Fayosim. Package insert. Lupin Pharmaceuticals, Inc; 2017.
43. Quartette. Package insert. Teva Women's Health, Inc; 2017.
44. Van Vliet HAAM, Raps M, Lopez LM, Helmerhorst FM. Quadriphasic versus monophasic oral contraceptives for contraception. *Cochrane Database Syst Rev.* 2011;CD009038. doi:10.1002/14651858.CD009038.pub2
45. Van Vliet HAAM, Grimes DA, Lopez LM, Schulz KF, Helmerhorst FM. Triphasic versus monophasic oral contraceptives for contraception. *Cochrane Database Syst Revn*. 2011;2011(11):CD003553. doi: 10.1002/14651858.CD003553.pub3
46. Anderson FD, Hait H. A multicenter, randomized study of an extended cycle oral contraceptive [published correction appears in Contraception. 2004 Feb;69(2):175]. *Contraception*. 2003;68(2):89-96. doi:10.1016/s0010-7824(03)00141-0
47. Westhoff C, Kerns J, Morroni C, Cushman LF, Tiezzi L, Murphy PA. Quick start: novel oral contraceptive initiation method. *Contraception.* 2002;66(3):141–145. doi:10.1016/s0010-7824(02)00351-7
48. Xulane. Package insert. Mylan Pharmaceuticals Inc; 2020.
49. Twirla. Package insert. Corium International, Inc; 2020.
50. Stewart FH, Kaunitz AM, Laguardia KD, Karvois DL, Fisher AC, Friedman AJ. Extended use of transdermal norelgestromin/ethinyl estradiol: a randomized trial. *Obstet Gynecol.* 2005;105(6):1389-1396. doi: 10.1097/01.AOG.0000160430.61799.f6
51. Lopez LM, Bernholc A, Chen M, et al. Hormonal contraceptives for contraception in overweight or obese women. *Cochrane Database Syst Rev.* 2016;18(8):CD008452. doi: 10.1002/14651858.CD008452.pub4
52. NuvaRing. Package insert. Merck & Co., Inc; 2020.
53. Annovera. Package insert. TherapeuticsMD, Inc; 2020.
54. Miller L, Verhoeven CH, Hout J. Extended regimens of the contraceptive vaginal ring: a randomized trial. *Obstet Gynecol.* 2005;106(3):473–482. doi:10.1097/01.AOG.0000175144.08035.74
55. Daniels K, Mosher WD. Contraceptive methods women have ever used: United States, 1982-2010. *Natl Health Stat Report.* 2013;(62):1-15.
56. Moreau C, Trussell J, Gilbert F, Bajos N, Bouyer J. Oral contraceptive tolerance: does the type of pill matter? *Obstet Gynecol.* 2007;109(6):1277–1285. doi:10.1097/01.AOG.0000260956.61835.6d

Assessment Questions

For the assessment questions, you will need to access the CDC Medical Eligibility Criteria for Contraceptive Use chart (www.cdc.gov/reproductivehealth/contraception/pdf/summary-chart-us-medical-eligibility-criteria_508tagged.pdf)

1. Choose the correct statement regarding the menstrual cycle:
   a. The follicular phase begins around day 14 of each menstrual cycle
   b. High levels of estradiol triggers menses to occur
   c. All women have a menstrual cycle that is 30 days in length
   d. The "LH surge" is responsible for catalyzing the final steps for ovulation to occur

2. **True or False:** According to the CDC Medical Eligibility Criteria for contraceptive use, a woman who has mild compensated cirrhosis should avoid use of combined hormonal contraceptives given their category 4 rating.
   a. True
   b. False

3. What is the category designation for the contraceptive patch in a woman with high risk for recurrent venous thromboembolism according to the CDC MEC?
   a. Category 1
   b. Category 2
   c. Category 3
   d. Category 4

4. **True or False:** Prior to starting a woman on an oral contraceptive, the pharmacist must ensure a pap smear and STI screening has been completed within the past year.
   a. True
   b. False

5. Choose the correct statement regarding intrauterine devices (IUDs):
   a. Active pelvic inflammatory disease is category 4 for initiation of IUDs
   b. Hormonal IUDs available in the US contain desogestrel or levonorgestrel
   c. The copper IUD was designed to decrease heavy menstrual flow
   d. All IUDs are effective at preventing pregnancy for at least 5 years

6. **True or False:** A patient has been taking a combined hormonal contraceptive containing ethinyl estradiol 20 mcg/

norethindrone acetate 1 mg for the past 4 months and never misses doses. The patient has been experiencing breakthrough bleeding 1 week after the end of menses. This is most likely due to insufficient progestin.
   a. True
   b. False

7. Choose the correct statement regarding progestin-only contraceptives:
   a. Women should avoid all progestin-only contraceptives until they are at least 4-6 weeks postpartum and no longer breastfeeding
   b. The acronym "LARC" refers to IUDs, the implant, and the injection
   c. The Depo-Provera® injection should be administered every 3 months
   d. The Nexplanon® implant provide continuous pregnancy prevention for up to 5 years

8. **True or False:** The duration of Depo-Provera® use should be limited to 2 years unless other contraceptive options are inadequate.
   a. True
   b. False

9. Choose the correct statement regarding combined hormonal contraceptives (CHCs):
   a. Ethinyl estradiol doses in combined oral contraceptives typically range from 10-80 mcg
   b. CHC dosage forms include the pill, the patch, and the ring
   c. CHCs should always be initiated on the first Sunday following most recent menses
   d. The ring should be replaced once weekly for 3 weeks, followed by a 1-week hormone free period

10. **True or False:** When considering extended-use dosing, it is recommended to use multiphasic over monophasic combined oral contraceptive formulations.
   a. True
   b. False

11. **True or False:** A woman who has recently started a new oral contraceptive and is experiencing some mild breast tenderness should be advised to continue her therapy for at least 3 months.
   a. True
   b. False

12. A woman has been taking ethinyl estradiol 35 mcg/norethindrone 1 mg for the past 6 months. She complains that she has had significant bloating and fluid retention since beginning the medication that has not subsided. She is not interested in switching to a non-oral option. Which modification is the best option to address her side effects?
   a. Change to ethinyl estradiol 35 mcg/norgestimate 0.18 mg
   b. Change to ethinyl estradiol 20 mcg/norethindrone 1 mg
   c. Change to ethinyl estradiol 35 mcg/norethindrone 0.5 mg
   d. No modification necessary. Patient should be counseled to trial medication for 1 year before switching

13. Given the following options, choose which adverse effects would require referral to a doctor and advised discontinuation of treatment of a woman's hormonal contraceptive regimen:
   a. Abdominal pain
   b. Chest pain
   c. Blind spots in field of vision
   d. Severe leg pain
   e. All of the above

14. JK is a 38yo female who was recently diagnosed with breast cancer. She was previously prescribed Junel Fe 1.5/30 (combined hormonal contraceptive) for pregnancy prevention. However, her oncologist told her she must discontinue this immediately. JK is extremely concerned about the additional stress a pregnancy may put on her body right now and is wondering how to most effectively prevent pregnancy during this difficult time. Which of the following recommendation(s) is most appropriate for JK? Hint – you may need to check the CDC Medical Eligibility Criteria chart.
   a. Depot medroxyprogesterone acetate injection
   b. Levonorgestrel intrauterine device
   c. Copper intrauterine device
   d. Transdermal patch
   e. Progestin implant

15. A 26-year old patient gave birth to her son 6 weeks ago and is currently breastfeeding. Prior to pregnancy, the patient took norethindrone (progestin-only pill) which she tolerated well. However, she does report that she often forgot to take doses which is how she got pregnant. Her past medical history is significant for migraines with aura. She states that she has no desire to become pregnant again any time soon. Which contraceptive options should be offered to the patient? Hint – you may need to check the CDC Medical Eligibility Criteria chart.
   a. Combined oral contraceptive and copper IUD
   b. Progestin-only pill and transdermal patch
   c. Levonorgestrel IUD and vaginal ring
   d. Progestin implant and combined oral contraceptive
   e. Levonorgestrel IUD and progestin implant

16. Did the activity meet the stated learning objectives? (if you answer no, please email sarahs@pswi.org to explain)
   a. Yes
   b. No

17. On a scale of 1 – 10 (1-no impact; 10-strong impact), please rate how this program will impact the medication therapy management outcomes or safety of your patients.

18. On a scale of 1 – 10 (1-did not enhance; 10-greatly enhanced), please rate how this program enhanced your competence in the clinical areas covered.

19. On a scale of 1 – 10 (1-did not help; 10-great help), please rate how this program helped to build your management and leadership skills.

20. How useful was the educational material?
   a. Very useful
   b. Somewhat useful
   c. Not useful

21. How effective were the learning methods used for this activity?
   a. Very effective
   b. Somewhat effective
   c. Not effective

22. Learning assessment questions were appropriate.
   a. Yes
   b. No

23. Were the authors free from bias?
   a. Yes
   b. No

24. If you answered "no" to question 23, please comment (email info@pswi.org).

25. Please indicate the amount of time it took you to read the article and complete the assessment questions.

Continuing Education Credit Information

The Pharmacy Society of Wisconsin is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education. Continuing education credit can be earned by completing the self assessment questions. Questions may be completed online at www.pswi.org or by mailing completed answer form to PSW, 701 Heartland Trail, Madison, WI 53717. Participants receiving a score of 70% or better will be granted 1.25 hours (0.125 CEU) credit through CPE Monitor within 60 day of quiz completion. Accurate birth date (MMDD) and CPE Monitor ID must be provided in order to receive this credit as required by ACPE.

This CE offering is offered free-of-charge to all PSW members. Nonmembers are charged $20 for each exam submitted to cover administrative costs.

November/December 2020
Review of Pharmacologic Contraceptive Options and Clinical Considerations for Use

ACPE Universal Activity Number: 0175-0000-20-147-H04-P

Target Audience: Pharmacists
Activity Type: Knowledge-based
Release Date: November 1, 2020
(No longer valid for CE credit after November 1, 2023)

Submit Your CE Online!

www.pswi.org/Education/Journal-CE

Quiz Answer Form

circle one answer per question

1) a b c d
2) a b c
3) a b c d
4) a b
5) a b c d
6) a b
7) a b c d
8) a b
9) a b c d
10) a b
11) a b
12) a b c d
13 a b c d e
14) a b c d e
15) a b c d e
16) a b
17)_____
18)_____
19)_____
20) a b c
21) a b c
22) a b
23) a b
24)_____
25)_____

Name_____Designation (RPh, PharmD, etc.)_____

CPE Monitor #_____ DOB (MMDDYY)_____

Preferred Mailing Address_____

City_____State_____ Zip _____

Is this your home ☐ or work ☐ address?

ONLINE EDUCATION

PSW Online CE offerings include:

- PSW Online CE
- Pharmacist Only Journal CE
- Pharmacist & Technician Journal CE
- Technician Only Journal CE

LECTURE PANDA

How to Claim CE:

- Click the desired Online CE link from the list.
- You will be directed to LecturePanda to complete registration and claim your CE.
- You will need to know your NABP ID in order to register (If you don't know your NABP ID, you can look it up on their website).
- Please make sure to use your "key email" address associated with your PSW account. (Not sure what email that is, check your profile)
- Once you have completed the assessment quiz and evaluation survey, you will be able to claim your CE credit to ACPE. Your credit should show up in your NABP Monitor within 24 hours

Once you have claimed your CE, your credits will appear in CPE Monitor within 24 hours. We strongly recommend you review your CPE Monitor portal quarterly.

JOIN US FOR THE

COLLABORATIVE CARE CONFERENCE

a virtual conference offered by Concordia University Wisconsin

Friday, January 15, 2021 | 8am–5pm

Bridging the Gap: Use of Telehealth to Meet the Needs of Our Patients Through Collaborative Care

As healthcare providers, we strive to provide high quality, effective care to our patients. Telehealth visits quickly evolved as an important tool in caring for patients during the COVID-19 pandemic. This interprofessional conference will explore the ways in which providers can bridge the gap between knowledge and utilization of telehealth and leverage this technology to assist in the provision of quality collaborative care to our patients. Conference presenters from a variety of professions and practice settings will share best practice tips as they describe their experiences implementing telehealth into their practice.

REGISTER AT: **cuw.edu/telehealth-conference**

CONCORDIA UNIVERSITY WISCONSIN | SCHOOL OF PHARMACY

ID CORNER
COVID-19 Testing: An Overview for Pharmacists

by Parmida Parvaz, PharmD

COVID-19, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), remains an ongoing global pandemic, with millions of confirmed cases worldwide. Detection through diagnostic testing is vital in treating and controlling the spread of the virus. Since the identification of the viral genome, several testing methodologies have been developed. Testing can be classified into two categories: molecular testing and serology testing. Molecular tests detect the presence of virus and can signify an active infection, whereas serology testing detects viral antibodies, indicating a past infection and/or exposure.[1] While the timing of viral and antibody presence can vary between patients, a general depiction of the different phases of COVID-19 can be seen in Figure 1. With the urgent need for broader testing capacities, the Food and Drug Administration (FDA) has issued emergency use authorizations (EUAs) for a variety of in-vitro diagnostic devices to be used for the detection and management of COVID-19.[2] Furthermore, routine labs for patients hospitalized with COVID-19 can be utilized to direct therapy for those with more severe disease.

Molecular Testing

Real-time Reverse Transcriptase Polymerase Chain Reactions (rRT-PCR)

The Infectious Disease Society of America (IDSA) guidelines for the diagnosis of COVID-19 recommend nucleic acid amplification testing (NAAT) in patients with clinical suspicion of COVID-19. The rRT-PCR detects nucleic acids of SARS-CoV-2 RNA from upper and lower respiratory specimens.[4] The RNA of SARS-CoV-2 can be detected one to three days before symptoms onset, peaks within the first week of infection, and declines over time. However, detection of RNA does not always indicate infectiousness, as patients can have a prolonged duration of viral shedding. Viral RNA has been detected in respiratory specimens as long as 12 weeks after symptoms onset; however, replication-competent virus was not found in patients after 3 weeks of symptom onset.[1] The IDSA guidelines recommend collecting nasopharyngeal, mid-turbinate, or nasal swabs rather than oropharyngeal swabs or saliva specimens. This suggestion is based on several studies that have shown a lower viral load in the throat compared to the nose and thus a lower sensitivity of oral swabs.[4] While specificity is near 100% for different specimen types, sensitivity was found in oral to be 56%, nasal 95%, nasopharyngeal 97%, and mid-turbinate 100%.[5] There are also several home kits granted FDA EUAs that involve patient-collected samples of nasal or mid-turbinate swabs. While data are limited, similar rates of detection have been shown between healthcare provider-collected and patient-collected nasal or mid-turbinate swabs.[6] A study by Tu et al. compared nasopharyngeal samples collected by a healthcare worker to tongue, nasal, and mid-turbinate samples collected by patients, and found estimated sensitivities to be 89.8%, 94.0%, and 96.2%, respectively.[6] Asymptomatic patients have a greater chance of false negative test results. Data are limited and diagnostic test performance has not yet been established in asymptomatic patients.[7] It is assumed that the overall test sensitivity is between 75% and 95%. The average incubation time is estimated to be 5 days; therefore, 5 to 7 days after exposure would

FIGURE 1. Viral and Antibody Presence in COVID-19[3-4]

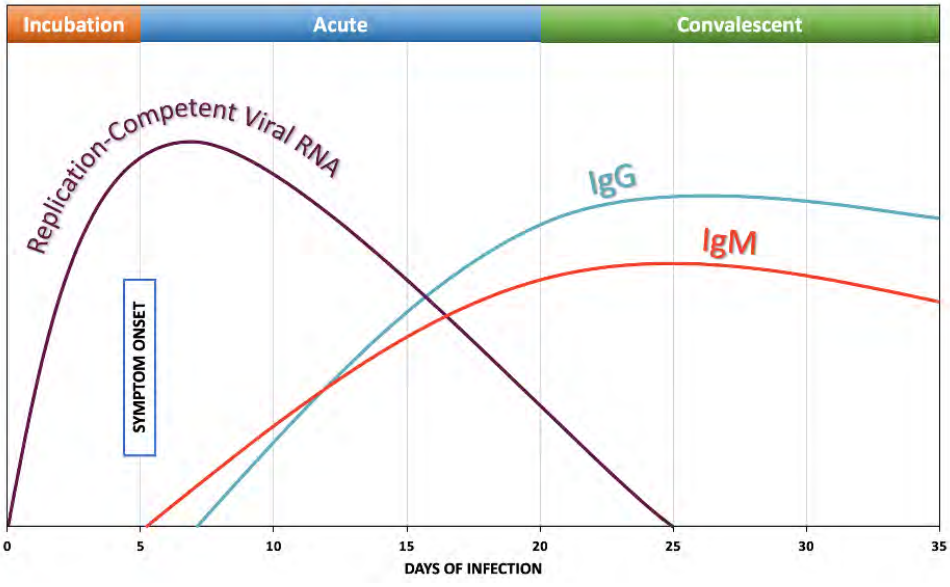


TABLE 1. COVID-19 Test Summary Table[2,4,8,9,10,21]

Test Type	Sensitivity	Specificity	Optimal Testing Time post-exposure	Advantages	Disadvantages
rRT-PCR	~98%	~95%	5-7 days	Gold standard	Inadequate sampling can skew results. Turnaround time may vary due to lab burden
LAMP	~95%	~99%	5-7 days	Rapid POC results, portable device	Complex primer design system, lack of data
Antigen	85-97%	100%	4-5 weeks	Less expensive, rapid results	Negative results should be confirmed with molecular test
Antibody	90-100%	95-100%	4-5 weeks	Determine population prevalence	Variable results based on patient and timing of test. Current evidence lacking in terms of correlation to actual immunity.

rRT-PCR = Real-time Reverse Transcriptase Polymerase Chain Reactions; LAMP = Loop-mediated Isothermal Amplification; POC = point of care

be a reasonable time to consider testing asymptomatic patients.[4] Currently, rRT-PCR remains the mainstay of diagnostic testing for COVID-19.

Loop-mediated Isothermal Amplification (LAMP)

As rapid point of care tests, an advantage of LAMP testing is that it can be conducted in a community care setting. The assay can produce results in 25 minutes from time of swab. A study by Österdahl and colleagues compared LAMP to repeated rRT-PCR results and found that the sensitivity and specificity was 80% for LAMP and 73% for rRT-PCR.[8] One example of isothermal amplification is Abbott's ID NOW™, which was granted FDA EUA and can produce results in 5 to 13 minutes. The device performance has been shown to be least 91.3% sensitive and 98.6% specific. Yet evaluations of this test have been highly controversial, with some researchers finding inaccuracies and high false negative rates.[9] Other rapid point of care tests, such as AQ-TOP COVID-19 Rapid Detection Kit ™ (SEASUN BIOMATERIALS Inc.), use reverse transcription-loop mediated isothermal amplification (RT-LAMP) technology. In a study by Huang and colleagues, 16 patient specimens that had been tested with rRT-PCR (8 positive, 8 negative) were also tested using RT-LAMP technology and showed identical results.[10] Studies thus far have been small in scale and unreliable, making LAMP testing less favorable than the rRT-PCR diagnostic tests.

Antigen Testing

Antigen tests are rapid, are typically cheap, and can result within minutes. The test

involves the binding of antibodies to targeted viral proteins and the generation of a signal that indicates detection of the antigen.[11] Two antigen tests for SARS-CoV-2 have received FDA EUA thus far. The downside of antigen testing is the weak sensitivity and specificity compared to nucleic acid testing. Quidel TM, a company that retains an EUA for its antigen test, reports that it meets the FDA's minimum 80% sensitivity requirement and is preparing a test that will reach 90% in the coming months.[12] On the FDA site for COVID-19 testing, there is a disclaimer stating that antigen tests cannot definitively rule out COVID and that a molecular test may be needed to confirm negative results.[2] Thus, while antigen tests can be more convenient and inexpensive, the results are less reliable than other methods of viral detection.

Serology/Antibody Testing

Serology tests detect the presence of an immune response and antibody production against the SARS-CoV-2. Antibodies are formed against viral antigens with IgM and IgG emerging concurrently, 5-7 days after symptoms onset.[3] In a study by Long and colleagues of 285 patients with COVID-19, 100% tested positive for antiviral IgG within 19 days of symptom onset.[13] Tests that detect IgM and/or IgG can determine whether an individual has been previously infected with COVID-19 and are not intended to replace a diagnostic test that indicates active infection. Results can be used to estimate the prevalence of viral exposure and infectivity within a defined population. The IDSA guidelines recommend testing for IgG 3 to 4 weeks after symptoms onset for highest sensitivity of results. Due to consistently higher sensitivity with IgG compared to IgM testing, antibody tests that detect IgG are recommended if there is need to assess for evidence of past COVID-19 infection.[4] Historically, serology tests have aided in identifying potential donors of convalescent plasma, which has been used as therapy for patients with severe COVID-19.[14] Presence of antibodies does not definitively indicate immunity, as there is much still not understood about protective immunity after COVID-19. In the same study by Long and colleagues, the authors compared immune response between asymptomatic and symptomatic patients and found that the symptomatic group had significantly greater IgG levels than the asymptomatic group in the acute phase (viral RNA present in respiratory specimen). It was also found that 40% of asymptomatic and 12.9% of symptomatic patients became seronegative for IgG in the early convalescent phase. The convalescent phase is the period at which clinical signs of illness have resolved, defined in this study as 8 weeks after discharge from hospital.[15]

A variety of serology test types

are available for commercial use. Neutralization tests measure the ability of antibodies to inhibit viral growth in the lab. Chemiluminescent immunoassay (CLIA) tests produce a fluorescent signal as viral proteins bind to antibodies. Enzyme-linked immunosorbent assays (ELISAs) use detector antibodies to signal viral antigen and patient antibody interactions. Lateral flow assays (LFAs) use patient samples over a membrane that contains the target antigen and leads to a colored display.[13] The FDA has given EUAs for several serology tests for IgG and/or IgM detection. The sensitivities range from 90% to100% with specificities of 95% to 100%.[16]

Laboratory Testing

Once a patient is diagnosed with COVID-19, therapeutic management can be determined by a variety of patient factors and test results. Severe systemic inflammatory response and respiratory failure are associated with increased mortality.[17] Biomarkers of inflammation can be used to direct treatment in select patient populations. Increased levels of C-reactive protein (CRP), interleukin 6 (IL-6), and erythrocyte sedimentation rate (ESR) have been associated with increased severity of disease.[18] The ElecsysTM (Roche Inc.) IL-6 immunoassay was granted FDA EUA and is used to measure interleukin-6 in human serum and plasma.[16] Such lab values can direct therapy toward immunomodulators such as tocilizumab, which acts as an IL-6 inhibitor.[19] Further laboratory tests can be utilized among hospitalized patients to detect COVID-19-associated coagulopathy, such as D-dimers, prothrombin time, platelet count, thromboelastography, and fibrinogen. These results can direct decisions for anticoagulation therapy for patients with severe COVID-19.[20] Additionally, liver and renal function tests are vital when remdesivir is being considered as therapy. Such tests are trended and interpreted along with clinical contents to help guide therapeutic decisions. While the body of data is constantly evolving for management of COVID-19, routine lab tests remain an important tool for creating a clinical picture and dictating appropriate treatment options.

Opportunities for Pharmacists

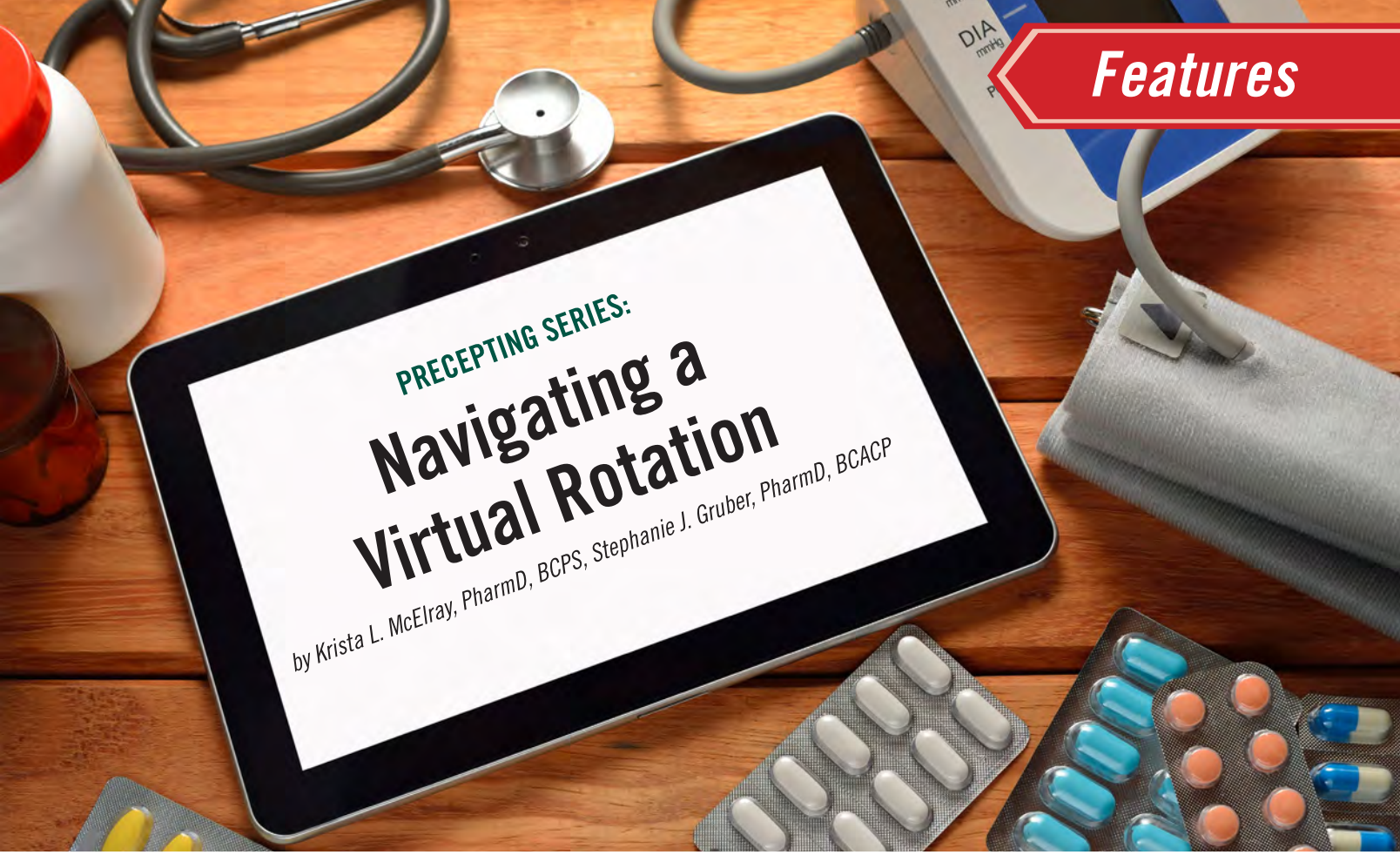
Pharmacists have played a pivotal role in patient care during the COVID-19 pandemic. Involvement in drug shortage management, development of treatment protocols, and interpretation of laboratory results are just some of the responsibilities pharmacists have taken on in the healthcare setting. Community pharmacists remain highly accessible health workers and have contributed in the education and screening of patients. The U.S Department of Health and Human Services has authorized pharmacists to order and administer COVID-19 tests. Furthermore, pharmacists will be vital in the immunization process when a COVID-19 vaccine becomes available. Pharmacists are frontline health workers with specialized knowledge of drugs and can provide patient care by utilizing these diagnostic and supporting tests for therapeutic management in their clinical practice.

Parmida Parvaz is a PGY2 Infectious Disease Resident at Clement J. Zablocki VAMC in Milwaukee, WI.

Disclosure: The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts and honoraria.

References

1. Centers for Disease Control and Prevention. Overview of testing for SARS-CoV-2. https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html Updated July 17, 2020. Accessed August 8, 2020.
2. U. S. Food and Drug Administration. Coronavirus testing basics. https://www.fda.gov/consumers/consumer-updates/coronavirus-testing-basics. Updated July 16, 2020. Accessed August 8, 2020.
3. Marca AL, Capuzzo M, Paglia T, et al. Testing for SARS-CoV-2 (COVID-19): a systematic review and clinical guide to molecular and serological in-vitro diagnostic assays. *RBMO*. 2020:00(0):1-17.
4. Infectious Disease Society of America. Guidelines on the diagnosis of COVID-19. https://www.idsociety.org/practice-guideline/covid-19-guideline-diagnostics/. Published May 6, 2020. Accessed August 8, 2020.
5. Wang X, Tan L, Wang X, et al. Comparison of nasopharyngeal and oropharyngeal swabs for SARS-CoV-2 detection in 353 patients received tests with both specimens simultaneously. *Int J Infect Dis*. 2020;94:107-109.
6. Tu YP, Jennings R, Cangelosi GA, et al. Swabs collected by patients or health care workers for SARS-CoV-2 testing. *N Engl J Med*. 2020;383(5):494-496.
7. Woloshin S, Patel N, Kesselheim AS. False negative tests for SARS-CoV-2 infection - challenges and implications. *N Engl J Med.* 2020;383(6):e38.
8. Österdahl MF, Lee KA, Lochlainn MN, et al. Detecting SARS-CoV-2 at point of care: preliminary data comparing Loop-mediated isothermal amplification (LAMP) to PCR. [published online April 4, 2020] medRxiv. doi.org/10.1101/2020.04.01.20047357
9. Basu A, Zinger T, Inglima K, et al. Performance of the rapid Nucleic Acid Amplification by Abbott ID NOW COVID-19 in nasopharyngeal swabs transported in viral media and dry nasal swabs, in a New York City academic institution. *J Clin Microbiol.* 2020;58(8):e01136-20.
10. Huang WE, Lim B, Hsu C, et al. RT-LAMP for rapid diagnosis of coronavirus SARS-CoV-2. *Microb Biotechnol.* 2020;13(4):950–961.
11. Scohy A, Anantharajah A, Bodéus M, Kabamba-Mukadi B, Verroken A, Rodriguez-Villalobos H. Low performance of rapid antigen detection test as frontline testing for COVID-19 diagnosis. *J Clin Virol.* 2020;129:104455.
12. Service, RF. Coronavirus antigen tests: quick and cheap, but too often wrong? *Science*. 2020. doi:10.1126/science.abc9586.
13. Long QX, Lui BZ, Deng HJ, et al. Antibody responses to SARS-CoV-2 in patients with COVID-19. *Nat Med.* 2020;26(6):845-848.
14. U. S. Food and Drug Administration. EUA authorized serology test performance. https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/eua-authorized-serology-test-performance. Updated August 01, 2020. Accessed August 8, 2020.
15. Long QX, Tang XJ, Shi QL, et al. Clinical and immunological assessment of asymptomatic SARS-CoV-2 infections. *Nat Med.* 2020;26(8):1200-1204.
16. U. S. Food and Drug Administration. In Vitro diagnostics EUAs. https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/vitro-diagnostics-euas#individual-serological. Updated August 08, 2020. Accessed August 8, 2020.
17. Zeng F, Huang Y, Guo Y, et al. Association of inflammatory markers with the severity of COVID-19: a meta-analysis. *Int J Infect Dis.* 2020;96:467-474.
18. Centers for Disease Control and Prevention. Interim clinical guidance for management of patients with confirmed coronavirus disease (COVID-19). https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html. Updated June 30, 2020. Accessed August 8, 2020.
19. Calabrese C, Rajendram P, Sacha G, Calabrese L. Practical aspects of targeting IL-6 in COVID-19 disease. [Published online October 7, 2020] *Cleve Clin J Med*. doi: 10.3949/ccjm.87a.ccc018
20. National institute of Health. Antithrombotic therapy in patients with COVID-19. https://www.covid19treatmentguidelines.nih.gov/adjunctive-therapy/antithrombotic-therapy/. Updated May 12, 2020. Accessed August 8, 2020.
21. Xpert® Xpress-SARS-CoV-2.[package insert]. Sunnydale, CA: Cepheid; 2020.



PRECEPTING SERIES:

Navigating a Virtual Rotation

by Krista L. McElray, PharmD, BCPS, Stephanie J. Gruber, PharmD, BCACP

Since Coronavirus Disease 2019 (COVID-19) hit Wisconsin in March 2020, precepting learners has changed dramatically. Pre-COVID-19, pharmacists worked alongside learners and were able to model, coach, and facilitate behaviors and learning in person. But now, given the restrictions in health care facilities and social distancing requirements, pharmacists have had to evolve their teaching style to incorporate virtual precepting.

Planning these virtual or socially distant rotations for learners is more important than ever to ensure learners receive strong experiences. Reviewing and strengthening rotation planning steps, activities, evaluation, and contingency planning helps ensure that experiential learning remains valuable to learners.

Pre-rotation

Any rotation should have a pre-rotation or kickoff meeting where general orientation for the learner to the rotation experience is completed. Here are some additional considerations to add to your pre-rotation checklist when accounting for virtual precepting and social distancing:

How do I keep my learner safe?

- Will my learner receive personal protective equipment from the health care facility, or do they need to plan to bring their own?
- Are learners allowed to enter patient rooms? If so, under what restrictions?

Where will you plan to have your student work?

- Does this space keep social distancing in mind?
- Is there a workstation or laptop for my learner to use?
- Can remote access to the electronic medical record (EMR) be provisioned for this learner?
- If my learner is going to be working remotely, how do I keep the learner actively engaged in patient care?
- Do we need scheduled touch-base meetings throughout the day?

What activities are required for the rotation?

- What required activities need to be completed on-site?
- How can we plan for required on-site activities to be completed as soon as possible in case the student or preceptor is sick or regulations around whether learners can be in the health care setting change?

Student Contingency Planning

In the current climate, preceptors should expect that restrictions and guidelines will change during the duration of a rotation. Thinking ahead about how to adjust or react as a primary or co-preceptor can help reduce anxiety. The guidance in this section is geared towards school of pharmacy student learners. Resident learners typically fall under the institutional policies as employees. Some of the possible scenarios for student contingency planning to consider are listed below:

My student was notified that they were in contact with someone who has tested positive for COVID-19.

- Tell the student not to come to rotation until cleared to return to work by a health care provider. Also be sure to review your school of

pharmacy policies as well as those from the health care institution.

- » If symptomatic, students should seek immediate testing as directed by their school of pharmacy.
- » Keep in mind that the symptoms of COVID-19 are very non-specific and even minor congestion and fatigue are considered symptoms that can qualify you for testing.
- » If asymptomatic, students should defer to their school of pharmacy for guidance or the local department of health.
  - ■ Currently in Madison, if asymptomatic, anyone can receive free testing at the Alliant Energy Center. The downside of this approach is that the result takes longer to come back. Also, a negative test result does not mean the person tested is not contagious if the exposure was recent.

My student has tested positive for COVID-19.

- Tell student not to return to rotation until cleared by their medical provider and to quarantine in their home as per the local department of health, school, and health care facility instruction.
- If the student feels well enough to continue to work, consider offering your rotation fully virtually if the learner has remote EMR access or the ability to complete make-up activities or projects.

My institution has stopped allowing students on-site.

- If you have already started the rotation and you can complete it fully virtually, try to complete the rotation with exclusively virtual precepting and learning.
- If the rotation has not yet started, consider offering a fully virtual rotation if able.
- If you find you can no longer accommodate the student learner, inform the school of pharmacy as soon as possible so alternative arrangements can be made.

During Rotation

There are many similarities between virtual precepting and in-person precepting. One similarity is the importance of reviewing the rotation schedule and establishing clear expectations early in the learning experience. Reviewing schedules and establishing expectations is even more important than usual since there might be few opportunities, if any, to touch base in-person regarding progress towards goals. Consider using a virtual meeting platform for video conferencing with functional audio and video so you and the learner can see each other's faces. Video meetings can help build rapport, ensure understanding by observation of visual cues, and help preceptors assess professionalism. Consider having a formal live video orientation on the first day of the rotation, if not prior to the start of rotation, to discuss items not unique to virtual precepting:

- Learning style preferred by learner
- Required learning activities
- Learner and preceptor schedules
- Rotation and learner expectations

An orientation meeting is also the perfect time to test technology and ensure adequate access to all required programs. Whenever possible, use a checklist to ensure you are not missing steps. One important checklist item is ensuring that offline contact information is exchanged to help with contingency planning.

Setting expectations becomes more critical to the success of a learning experience when you will not be located in the same physical space. Consider the following when setting expectations for a virtual rotation:

- Reach out prior to a learning experience to determine roles, responsibilities, and daily workflow.
- Communicate about any consistent time slots where you might be less available to the learner, such as daily meetings or rounds.
- Set clear expectations for when patient care notes should be completed, and which patients will be reviewed with the preceptor.

There will be less opportunity to observe learner performance directly. Clearly communicating expectations can help ensure mutual understanding between preceptor and learner. Video conferencing might not be available, and thereby, verbal communication skills become that much more important for building rapport and precepting remotely. Consider the following when communicating with learners in a virtual environment:

- Remember simple pleasantries: "How is your day going?" "How was your weekend?"
- Use virtual video meeting platform (e.g. WebEx, Zoom, Skype) and lead by example by having your video turned on during discussions whenever possible. Live video is especially important if more constructive feedback is given.
- Discuss baseline understanding and competencies for both rotation objectives and technology requirements.
- Use screen-sharing capabilities as able.
- Be clear with wording and directions: "Left click on the notes tab on the bottom banner of your screen. Left click on new note…"
- Ask for feedback: "How can I better support you in this experience?"

With changing responsibilities in a time of more telework, there might be learner downtime or time where the preceptor has a conflicting obligation. Consideration for any downtime activities should be dependent on the learner level of autonomy and availability of the preceptor to introduce and/or explain the activity. Consider the following ideas to help plan your learner's time:

- Arrange for the learner spend time with a colleague (consider a fellow pharmacist or interprofessional co-worker).
- Schedule dedicated project time or patient care work up time.
- Discuss an already prepared topic presentation.
- Find a topic or journal article of interest and schedule a future journal club or topic discussion.
- Assign the learner work to do that offsets work for the preceptor—consider prepping a medication

message, provider alert, or patient care note.
- Provide a self-directed learning activity on either a disease state or learner wellness (e.g. ASHP Resident Resources, ASHP Busy Day Toolkit) for the learner.

Post-Rotation

Ideally, feedback is requested and received throughout the rotation so the experience can be altered to meet the needs of both the learner and the preceptor on an ongoing basis, and this can still be accomplished with virtual precepting. Scheduling time weekly for feedback and evaluation with the learner can help to achieve this ongoing status of improvement. Summing up the rotation feedback and sharing it with the learner, especially regarding how successful virtual precepting and learning was during the rotation, is especially important. This feedback for the learner likely centers around their virtual professionalism, communication skills, ability to plan, and response to change. This specific virtual learner feedback, coupled with your own reflection, will help to guide what adjustments to make for future rotations, adjustments the learner needs to make, and how you can personally better accommodate future virtual learners as a preceptor. Feedback from your virtual precepting team is also vital to ensuring adequate learner support and continued preceptor assistance in future learning experiences. Be transparent with your precepting team and other team members with any changes made to the rotation and be receptive to ongoing feedback. Consider the following when reflecting on a learning experience:

- What were the major successes of the learning experience?
- What specific feedback did the learner provide?
- What technology challenges occurred?
- What learning experience objectives were not met?
- What physical space concerns exist during the next learning experience?
- Which preceptors will be available during the next rotation?
- Will multiple learners be present for the next rotation?
- Do I need to reach out to the school of pharmacy, a residency program director, or other departmental leader?

Closing

Virtual precepting comes with its own unique set of challenges, but a rewarding experience for both learner and preceptor is very achievable. A lot of what makes up a strong in-person rotation remains true for a virtual rotation. Additional effort is needed throughout the rotation to establish a schedule and plan. Setting the plan is helpful, but ultimately, expecting the plan will change is a healthy approach that will prepare both preceptor and learner for change. Remember to be flexible, adaptable, mindful, and kind as things are continuing to change. A positive attitude will strengthen the learner-preceptor relationship as well as ultimately benefit patient care.

Krista McElray is the Education & Development Coordinator, a Clinical Pharmacist in Internal Medicine, and the PGY1 Residency Program Director at UW Health in Madison, WI. Stephanie Gruber is a Clinical Pharmacy Specialist and PGY2 Ambulatory Care Residency Program Director at William S. Middleton Memorial Veterans Hospital in Madison, WI.

Disclosure: The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

PRECEPTING SERIES:

Quality Counts: Writing Meaningful References

by Julie K. Dagam, PharmD, BCPS, FASHP, Suzanne Turner, PharmD, FASHP

Whether you're new to precepting or a seasoned preceptor, it is likely that one of your learners will eventually ask, "Will you be a positive reference for me when I apply to residency programs?" And then you might wonder, "How can I make my reference especially meaningful?"

References and the Full Residency Application

It is important to first understand how references fit into the full residency application. The residency application consists of several standardized components, including the candidate's letter of intent, curriculum vitae (CV), transcripts, and three references. These components are submitted through a web-based tool, Pharmacy Online Residency Centralized Application Service (PhORCAS). PhORCAS uses three portals to streamline each candidate's residency application components. Reference writers submit their reference for a candidate by completing and submitting a standardized reference form through the reference portal, accessed through an individualized sign-in code. If the candidate applies to multiple programs, reference writers have the option to customize their comments for each program to which the candidate applies. Candidates submit other application components and specify which programs they are applying to through an application portal. Each program receives access to a collated file of application documents for each candidate who selected to apply to their program through the program portal, known as WebAdMIT.[1]

Components of a Residency Reference

Prior to the introduction of PhORCAS, submission of residency application components was not streamlined, and reference writers submitted written letters directly to program directors. Available literature questioned the benefit of reference letters.[2] After PhORCAS was introduced in 2012, reference letters were transitioned to a standardized reference form and reference letters were phased out.

The current PhORCAS standardized reference form includes four main sections[3]:

- Recommender demographics
- Characteristics
- Narrative comments
- Recommendation concerning admission

The *recommender demographics* section collects information regarding the reference writer's relationship with the candidate. In the *characteristics* section, the reference writer evaluates the candidate in certain characteristics (such as organization/time management, clinical problem solving skills, and professionalism) using a rating scale (exceeds, appropriate, fails to meet, or N/A). This section also includes space for reference writers to include additional free-text comments. The *narrative comments* section includes space for the reference writer to use free-text responses to describe the nature of their interaction with the candidate, two strengths, two areas for improvement, other characteristics/observations not otherwise addressed about the candidate, and program-specific comments. Finally, the *recommendation concerning admission* section requires the reference writer to select a final recommendation from a list of options: highly recommend, recommend, recommend with reservation(s), or do not recommend.

In addition to using a combination of rating scale assessments and free-text comments to complete the form, reference writers have the option to customize their comments for each program to which the candidate applies.[1] The full PhORCAS standardized reference form can be accessed on the American Society of Health-System Pharmacists (ASHP) website.[3]

Value of References to Reviewers

References provide the reviewer with an important perspective of the candidate.[4-5] The reviewer can take each reference's perspective into consideration to help differentiate the candidate from other applicants and to gain a broader representation of the candidate. The reviewer can also use the provided information to assess whether the candidate's skills, characteristics, behaviors, strengths, and weaknesses align with their residency program.

"Positive" versus "Meaningful" References

Because a reference can influence whether the candidate secures an interview, references are considered an important component of the residency application. Residency candidates are often encouraged to seek reference writers who are willing to provide a "positive" or a "strong" reference.[4] Reference writers recognize the importance of references in the residency application and often feel pressure to provide a reference that[5]:

- Is overly positive
- Inflates strengths
- Minimizes/veils weaknesses
- Is an inaccurate portrayal of the candidate

Unfortunately, references with the above characteristics paint a flawed picture of the candidate, and thus are not meaningful.[5] Reviewers might disregard references that do not appear to contain an accurate representation of the candidate or that do not contain enough specific details about the candidate. Ultimately, these "positive" types of references might negatively impact the candidate's application and the chance of securing an interview.

In order to be considered valuable

to reviewers, the reference must contain details that are meaningful. Meaningful references contain[5]:

- An objective/honest assessment
- Specific statements about strengths/areas for improvement
- Context/examples
- Strengths not over-inflated
- Areas for improvement not "disguised"

Research published in 2020 examined nearly 6,000 PhORCAS references submitted to four PGY1 pharmacy residency programs. The authors found minimal correlation between reference writers' ratings of characteristics in PhORCAS with application score, applicant ranking, and invitation to interview. This study supports that a "positive" reference without meaningful content is not valuable to the reviewer.[6]

Unpublished data further supports these considerations. The area for improvement response within the PhORCAS narrative comment section was examined for a pool of over 600 submitted residency references. The three most frequent responses were "confidence," "clinical knowledge," and either "none" or left blank. Reviewers noted a lack of specific examples in the associated supporting or free-text comment sections. Because these responses were so broad, the reviewers believe that specific wording or examples would have been more impactful.[7]

Avoiding Pitfalls

When writing a reference, it is critical to avoid the pitfalls that result in an inaccurate portrayal of the candidate. Instead:

1. Ensure your reference is objective and honest. *Is the student truly "the best student you've ever precepted"? Does the student really have no areas for improvement?*
2. Include supporting comments that are specific, provide context, and include examples. *Is the strength/area for improvement specific rather than generic? What unique perspective are you providing? (supporting context) What activities did you observe that should be highlighted? (examples)*
3. Make sure your ratings (exceeds/appropriate/fails to meet; and highly recommend/recommend/recommend with reservation) match your supporting comments.

In order to highlight the important differences between a positive reference and a meaningful reference, let's consider the following example. An APPE learner we'll call "AL" completed her first acute care experience on your internal medicine rotation in August. Because of her experience on your rotation, AL decided to pursue PGY1 pharmacy residency training and asked you to be a reference. When assessing AL's clinical problem solving skills in your reference, you state *"AL could continue to improve her clinical knowledge, and residency training will provide AL the environment to do this."*

A more meaningful assessment would:

- Be specific: *"AL could improve independently applying clinical knowledge to patient care plans.;"*
- Include your unique perspective as supporting context: *"AL's baseline clinical knowledge was initially weaker than the other APPE student on rotation.;"*
- Highlight activities you observed as examples: *"AL recognized this weakness, so she independently came in early to prepare and reviewed disease states on her own time. By the end of the rotation, she strengthened her clinical knowledge base and was applying it to patient care plans with preceptor guidance."*

Strategies for Writing a Meaningful Reference

One strategy for facilitating the inclusion of specific overall impressions and supporting examples is to use a tool to organize your interactions with potential candidates. It is recommended to use the tool for all learners, because you might be surprised by who might ask you to be a reference. For their tool, the authors created a spreadsheet based on the PhORCAS standardized recommendation form. This "reference intake tool" includes a worksheet

FIGURE 1. Reference Intake Tool—Characteristics Section

Student Name:
Date of Rotation:
Rotation Type:
College of Pharmacy:

Characteristics	Ratings	Comments
Writing skills (clincial, email and assigned writings)	Exceeds	
Oral communication skills	Exceeds	
Leadership/mentoring skills	Exceeds	
Assertiveness	Exceeds	
Ability to organize and manage time	Exceeds	
Ability to work with peers and communicate effectively	Exceeds	
Clinical problem solving skills	Exceeds	
Effective patient interactions	Exceeds	
Dependability	Exceeds	
Independence and resourcefulness	Exceeds	
Willingness to accept constructive cristism	Exceeds	
Emotional stabilty and maturity	Exceeds	
Professionalism (professional attire and professional demeanor)	Exceeds	

Please describe the nature of your interaction with the candidate.
Under a period of normal workload or abnormal?
What frequency or number of directly observed clinical activites of the candidate?
The degree of independence the candidate was given?
Was that independece reduced or increased over the duration of a rotation?
How did the candidate's skills compare with (in order of preference) concurrent residents, peer students or students from other colleges?

FIGURE 2. Reference Intake Tool—Narrative Comments Section

Two strengths of this candidate and how you believe these strengths will be beneficial to his/her success in a residency program.

1.

2.

Two areas for improvement of this candidate and how you believe a residency program will be able to work with the candidate's noted areas for improvement

1.

2.

Any other characteristics or observances of this candidate not mentioned previously. In comparison to all students in the last two years, the candidate ranks:

Recommendation Highly Recommend

Student 1 Name | Student 2 Name | Student 3 Name | Tips Sheet

for each student with drop-down boxes for ratings and space for supporting comments (Figures 1 and 2). The tool is completed after interacting with each learner, and helps the user track objective assessments and specific examples that can later be used within the reference. This is especially helpful because a significant amount of time could pass before the reference is needed, and once asked, the turnaround time to submit the reference is short. The authors further customized their tool to include an internal "bank" of potential specific phrasing options (Figure 3).

In addition, when asked to be a reference, many writers find it helpful to ask the candidate for further information about the position(s). Details including what attracted the candidate to the position and how the candidate feels the position will help meet their professional goals gives the reference writer context. This context can help the reference writer tailor examples, which enhances the reference.[4]

References for Post-Graduate Year Two (PGY2) Positions or Jobs

The concepts described above can also be applied when serving as a reference for a candidate applying for a PGY2 position or a job. Unless the position is being offered through the Early Commitment Process[8], PGY2 positions utilize the same application process and PhORCAS standardized recommendation form described above. Similarly, employers typically use a standardized reference process that includes a combination of ratings and free-text comments during the hiring process. Within residency programs specifically, candidates for PGY2 programs are expected to be performing at a higher level of practice than candidates for PGY1 programs. Although certain characteristics can be of differing importance based on the position, the importance of an accurate and meaningful reference remains constant.

Saying "no" to Serving as a Reference

In some situations, the best response to, "Will you be a positive reference for me?" is to decline the request. Consider saying no to serving as a reference for a candidate when:

- you do not know the candidate well enough to provide a meaning reference
- you know you cannot allocate the time necessary to provide a meaningful reference
- your honest assessment would not benefit the candidate

If you decide to decline, it is important to respond to the candidate quickly to allow them time to ask others. Briefly including your reason can be constructive to the candidate.

Key Takeaways

Now when you are asked, "Will you be a positive reference for me when I apply to residency programs?" you no longer need to wonder how to make your reference more meaningful. Instead, remember three simple takeaways:

1. Be honest, specific, and include context/examples. Do not over-inflate strengths or disguise weaknesses.
2. Have a plan to manage reference requests—develop a system to keep track of your impressions.
3. Set your goal to highlight realistic strengths and areas for improvement rather than "getting the candidate an interview."

Julie Dagam is the Residency Program Director, PGY1 Pharmacy – Aurora Health Care Metro, Inc. at Advocate Aurora Health in Milwaukee, WI. Suzanne Turner is the PGY1 Program Director and Manager, Pharmacy Residency and Education at Lee Health in Fort Myers, FL

Acknowledgments: The content of this manuscript was adapted from a presentation created by the authors and originally presented on October 18 and October 19, 2019, at the ASHP National Pharmacy Preceptors Conference in Dallas, Texas.

Disclosure: Both Julie Dagam and Suzanne Turner have full access to all the data and take responsibility for the integrity of the data and the accuracy of the data analysis for the unpublished data reference.
The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

References

1. ASHP PhORCAS frequently asked questions (FAQs). American Society of Health-System Pharmacists. https://www.ashp.org/-/media/assets/professional-development/residencies/docs/phorcas-rpd-faq.ashx . Accessed July 22, 2020.
2. Ensor CR, Walker CL, Rider SK, et al. Streamlining the process for initial review of pharmacy residency applications: an analytic approach. *Am J Health-Syst Pharm*. 2013;70(19):1670-1675.
3. PhORCAS recommendation form. American Society of Health-System Pharmacists. https://www.ashp.org/-/media/assets/professional-development/residencies/docs/phorcas-recommendation-form.ashx. Accessed July 22, 2020.
4. Chim C. A strong residency candidate needs strong reference writers. American Pharmacists Association. https://www.pharmacist.com/strong-residency-candidate-needs-strong-reference-writers. Published September 14, 2015. Accessed July 22, 2020.
5. Nisly SA, Isaacs AN, Paloucek FP. Fixing letters of "wreck"-ommendation. *J Am Col Clin Pharm* 2018;1(2):119-120.
6. Atyia SA, Paloucek FP, Butts AR, et al. Impact of PhORCAS references on overall application score for postgraduate year 1 pharmacy residency candidates. *Am J Health-Syst Pharm*. 2020;77(15):1237-1242.
7. Dagam JK, Turner S (2019). [Residency References]. Unpublished data.
8. Early Commitment Process. National Matching Services Inc. https://natmatch.com/ashprmp/ecp.html. Accessed July 22, 2020.

FIGURE 3. Reference Intake Tool with Added Specific Phrasing Options

Student Name:
Date of Rotation:
Rotation Type:
College of Pharmacy:

Characteristics	Ratings	Examples of specific phrasing (customize to your own preferences, could be positive or constructive, include context)
Writing skills (clinical, email and assigned writings)	Exceeds	needs improvement in their technical writing, uses abbreviations in communication
Oral communication skills	Exceeds	needs to speak clearly, needs to be able to get to the point, gets nervous when speaking, speaks softly
Leadership/mentoring skills	Exceeds	difficulty taking ownership of an assignment, needs to be more creative "think outside the box", difficulty considering other points of view, difficulty speaking up in a group
Assertiveness	Exceeds	needs to speak up on rounds, needs to move out of comfort zone, needs to be more engaged in group settings
Ability to organize and manage time	Exceeds	lack of motivation, not being organized, unable to prioritize, difficulty multitasking, does not meet deadlines
Ability to work with peers and communicate effectively	Exceeds	needs to volunteer for assignments, doesn't pull their weight within a team, needs to let others participate in discussion, difficulty in a team when they are not the lead
Clinical problem solving skills	Exceeds	knows EBL but needs to apply it to patients, application of the clinical knowledge, gets caught up in the details/overthinks, hard time seeing the big picture
Effective patient interactions	Exceeds	needs to use emotional intelligence, needs to show more empathy, needs to let the patients speak, needs to enhance their cultural competence, respect patient time
Dependability	Exceeds	had to follow up on their assignements, didn't complete all assignments, work meets expectations but does not exceed
Independence and resourcefulness	Exceeds	learn to use resources available in order to be more independent, needs to ask for more feedback (but takes it well), is too independent- needs to know when to ask for guidance, expects to be "spoon-fed"
Willingness to accept constructive cristism	Exceeds	gets defensive, makes excuses, open to feedback but does not incorporate it into practice
Emotional stability and maturity	Exceeds	gets frustrated, sarcastic, overly emotional, needs to learn how to accurately self-reflect, too hard on themselves
Professionalism (professional attire and professional demeanor)	Exceeds	needs to control non-verbal, flat affect - comes across laid back, needs to take initative instead of waiting for instruction

Original Work

Attainment of Area Under the Curve Targets and Incidence of Nephrotoxicity Utilizing Local Pharmacokinetic Vancomycin Dosing Guidelines

by Alanna Ambrosius, PharmD, Kent Cook, PharmD, Jim Davis, RPh, Justin Guthman, PharmD

Abstract

Objective: Current vancomycin monitoring guidelines recognize area under the curve (AUC) to minimum inhibitory concentration (MIC) ratio as the target efficacy parameter for vancomycin. Despite the historical use of trough-only dosing as a surrogate marker for the AUC/MIC ratio, recent studies have challenged this strategy's efficacy and safety. The objective of this study is to determine the extent to which vancomycin dosing and monitoring achieves target AUC levels and avoids nephrotoxicity. Secondary outcomes include incidence of clinical failure.

Methods: While receiving vancomycin therapy, adult patients were dosed and monitored according to current practice, with one additional vancomycin concentration drawn per dose-adjustment period to calculate the AUC. For the primary outcomes, percent of AUC levels within the established goal range of 400-600 mg h/L was calculated. Percent of patients who developed nephrotoxicity within 21 days of vancomycin initiation, or until the termination of their inpatient stay, was calculated. For the secondary outcomes, escalation to other methicillin-resistant Staphylococcus aureus active agents was measured.

Results: Of 46 AUC values calculated, 39.1% of values were in the target range of 400-600 mg h/L. There were notable variations between trough levels obtained and the calculated AUC. Of 43 patients, 16.3% developed nephrotoxicity. When limited to nephrotoxicity likely attributable to vancomycin, the incidence was lower at 6.98%. One patient required escalation of therapy to an alternate agent.

Conclusion: Trough levels obtained during this study did not accurately predict AUC values calculated, and incidence of nephrotoxicity was confounded by concomitant nephrotoxic agents.

Area under the curve (AUC) to minimum inhibitory concentration (MIC) ratio, or AUC/MIC, is currently recognized as the target efficacy parameter for the dosing of vancomycin.[1] An AUC/MIC specifically ≥ 400 is the recommended efficacy goal. Due to the difficulty of calculating the AUC/MIC ratio, the 2009 vancomycin monitoring guidelines (from the American Society of Health-System Pharmacists, Infectious Diseases Society of America, and Society of Infectious Diseases Pharmacists) promoted trough monitoring as a surrogate marker for this AUC/MIC target. These guidelines recommended trough concentration targets of > 10 mg/L or, for complicated infections, 15-20 mg/L. This goal range will provide an AUC/MIC of ≥ 400 in most patients if the MIC ≤1 mg/L.

Despite widespread use of trough-only dosing to achieve target levels of 10-20 mg/L, recent studies have challenged this dosing strategy's efficacy and safety. Evidence is lacking to support the correlation of higher vancomycin trough levels with clinical efficacy. Hale et al found no difference in attainment of target AUC ≥ 400 between patients with trough levels of 10-14.9 mg/L, or > 20 mg/L compared to those with trough levels 15-20 mg/L.[2] However, many studies have found increased rates of nephrotoxicity with higher trough levels.[2-4] Neely et al demonstrated that trough-only dosing underestimated AUC, potentially increasing the risk of toxicity and unnecessarily high doses.[5] Aljefri et al found that an AUC < 650 mg h/L was associated with less nephrotoxicity, and that use of an AUC monitoring strategy was less likely to lead to nephrotoxicity versus trough monitoring strategies.[6] Chavada et al identified a higher likelihood of nephrotoxicity in patients with a 24-hour AUC of > 563 mg h/L.[4] After the implementation of AUC-based dosing at Detroit Medical Center, AUC-based dosing was found to be associated with a lower likelihood of nephrotoxicity, lower total daily doses and AUC levels, and lower trough levels.[7]

Considering this evidence, recently

updated guidelines now suggest the use of AUC-guided dosing.[8] An AUC/MIC ≥ 400 will remain the recommended efficacy target (for bactericidal activity). The guidelines note an increased risk of nephrotoxicity as both trough concentrations and AUC increase, specifically above trough levels of 15-20 mg/L and above an AUC of 650-1300 mg h/L. The suggested goal AUC to maximize efficacy and reduce toxicity is therefore 400-600 mg h/L. Notably, this guidance will no longer recommend trough-only monitoring, with a 15-20 mg/L goal, for patients with serious methicillin-resistant Staphylococcus aureus (MRSA) infections.

AUC-based dosing can be accomplished with Bayesian estimations or pharmacokinetic (PK) equations. The Bayesian approach uses probability estimations to dose based on both population data and patient-specific information.[9] Due to the financial implications of purchasing Bayesian dosing software, the use of PK equations might be an appealing alternative. The PK approach consists of collecting two vancomycin levels between the time of drug distribution and the time of the next dose, and then calculating the patient-specific AUC from these values. Like current PK trough-monitoring approaches, this equation-based approach will not provide accurate estimations in situations such as rapid decline in renal function. As compared to Bayesian software, Turner et al found that the equation-based method can produce similar or better accuracy and bias in calculation of the AUC.[10] In response to the growing evidence in favor of AUC-based dosing, several institutions have begun to adopt AUC-based vancomycin dosing and monitoring. A 2019 survey of institutions reported that 23.1% of academic medical centers have implemented AUC-based monitoring.[11] Of the sites that had not implemented AUC-based monitoring, 88.3% did not plan to implement, or were unsure about implementing, AUC-based dosing. The most common barrier to implementation was unfamiliarity with this dosing strategy.

Consistent with many inpatient pharmacy departments, the pharmacists at Ascension St. Clare's Hospital autonomously dose vancomycin under a consult service. Approximately one-third of Staphylococcus aureus isolates at this site are methicillin resistant; therefore, it is important to have this medication available.[12] Following local guidelines, vancomycin is currently dosed with a goal trough concentration of 10-20 mg/L, or, for complicated infections, 15-20 mg/L.[13] Empiric dosing to achieve these goals often includes initial doses of 15-20 mg/kg actual body weight administered every 8 to 24 hours, depending on renal function or other patient-specific factors. There is a maximum of 2.5 grams per dose. Loading

TABLE 1. Baseline Survey Results

Question	Response Options	Result, No. (%)
Do you feel confident in your ability to dose vancomycin therapy based on trough concentrations?	Yes	25 (89.3)
	Somewhat	3 (10.7)
	No	0 (0)
What is the preferred kinetic measure for vancomycin efficacy?	Peak	1 (3.6)
	AUC/MIC	15 (53.6)
	Trough	11 (39.3)
	Peak/MIC	1 (3.6)
Vancomycin trough levels are equated/associated with efficacy.[a]	True	21 (75)
	False	6 (21.4)
What is the preferred trough level for the effective treatment of meningitis?	10-15 mcg/ml	0 (0)
	15-20 mcg/ml	26 (92.9)
	10-20 mcg/ml	0 (0)
	>20mcg/ml	2 (7.1)
Vancomycin peak levels are equated/associated with toxicity.	True	14 (50)
	False	14 (50)
What is the preferred AUC/MIC[b] ratio for the effective treatment of most indications?[a]	>200	2 (7.1)
	>400	20 (71.4)
	>600	3 (10.7)
	<800	0 (0)
Vancomycin trough levels are equated/associated with toxicity.	True	17 (60.7)
	False	11 (39.3)
Do you feel confident in your ability to dose vancomycin therapy based on AUC calculations?	Yes	0 (0)
	Somewhat	1 (3.6)
	No	27 (96.4)
How many years have you been practicing as a pharmacist?[a,c]	Free Response, <10 years	9 (32.1)
	Free Response, ≥10 years	18 (64.3)

aSome respondents did not select an answer
bAUC = area under the curve, MIC = minimum inhibitory concentration
cFree response reported as <10 or ≥10 years for the purposes of this publication

TABLE 2. Baseline Characteristics

Subject Parameter	Result
Mean (+/-SD[a]) age, years	60.56 (12.09)
Median (IQR[b]) age, years	61 (15.25)
No. (%) male sex	27 (62.8)
Mean (+/-SD) wt, kg	85.58 (23.02)
Median (IQR) wt, kg	86 (27.25)
Mean (+/-SD) ht, cm	170.96 (12.71)
Median (IQR) ht, cm	172.35 (19.68)
Mean (+/-SD) baseline serum creatinine, mg/dl	0.90(0.37)
Median (IQR) baseline serum creatinine, mg/dl	0.9 (0.48)
Mean (+/-SD) no. of concomitant nephrotoxins	1.41 (0.93)
Median (IQR) no. of concomitant nephrotoxins	1 (1)
No. (%) pt with existing nephrotoxicity within 72 hours before vancomycin initiation	4 (9.3)
No. (%) pt with baseline serum creatinine >2 mg/dL	0 (0)
No. (%) pt receiving:	
ACEi/ARB[c]	8 (18.6)
Acyclovir	2 (4.7)
Allopurinol	1 (2.3)
Aminoglycoside	0 (0)
Amphotericin B	0 (0)
Piperacillin/tazobactam	8 (18.6)
Cyclosporine	0 (0)
Tacrolimus	0 (0)

TABLE 2. Baseline Characteristics Cont.

Subject Parameter	Result
Cidofovir	0 (0)
Cisplatin	0 (0)
Contrast dye	21 (48.8)
Diuretics (loop or thiazide)	14 (32.6)
Fluoroquinolone	4 (9.3)
Foscarnet	0 (0)
Lithium	1 (2.3)
Mannitol	0 (0)
Methotrexate	0 (0)
Mitomycin-C	0 (0)
NSAIDs[d]	5 (11.6)
Pamidronate	0 (0)
Zoledronate	0 (0)
Pentamidine	0 (0)
Phenytoin	0 (0)
Rifampin	0 (0)
Sulfonamides	1 (2.3)
No. (%) pt with antibiotics, other concomitant	40 (93)
No. (%) pt with critical care admission	16 (37.2)
No. (%) pt with initial culture results positive	16(37.2)

[a]SD = standard deviation
[b]IQR = interquartile range
[c]ACEi = angiotensin converting enzyme inhibitor, ARB = angiotensin receptor blocker
[d]NSAIDs = non-steroidal anti-inflammatory drugs

doses of 25-30 mg/kg may be utilized for complicated infections. Pharmacist-guided vancomycin dosing and monitoring might differ between organizations, based on aggressiveness per indication, or due to varying practices such as dose capping. While various sites have shown positive clinical results of AUC-based dosing, the baseline AUC achieved with trough-based dosing is rarely reported for comparison.

To better understand the efficacy and safety of current trough-based dosing and monitoring strategies employed at this site, this study proposes calculation of the AUC achieved as well as incidence of nephrotoxicity in relation to the AUC.

Methods

This study was formally evaluated by the Ascension Wisconsin Institutional Review Board (IRB) and determined to be exempt from IRB review.

Outcomes

Primary: To evaluate how well current institutional practice (traditional trough-based dosing) achieved target AUC levels, the percent of AUC levels within the desired therapeutic range (400-600 mg h/L) was measured. The percent of AUC levels above and below the range (> 600 mg h/L or and < 400 mg h/L) was also measured. To assess the incidence of nephrotoxicity under current institutional practice, an increase in serum creatinine of > 0.5 mg/dL or a ≥ 50% increase from baseline from day of vancomycin initiation to day 21 or termination of inpatient stay was measured.[1,14-15]

Secondary: To assess the outcome of clinical failure, the escalation of therapy to MRSA active antimicrobials (daptomycin, linezolid, or ceftaroline) was measured.

FIGURE 1. Vancomycin Therapy

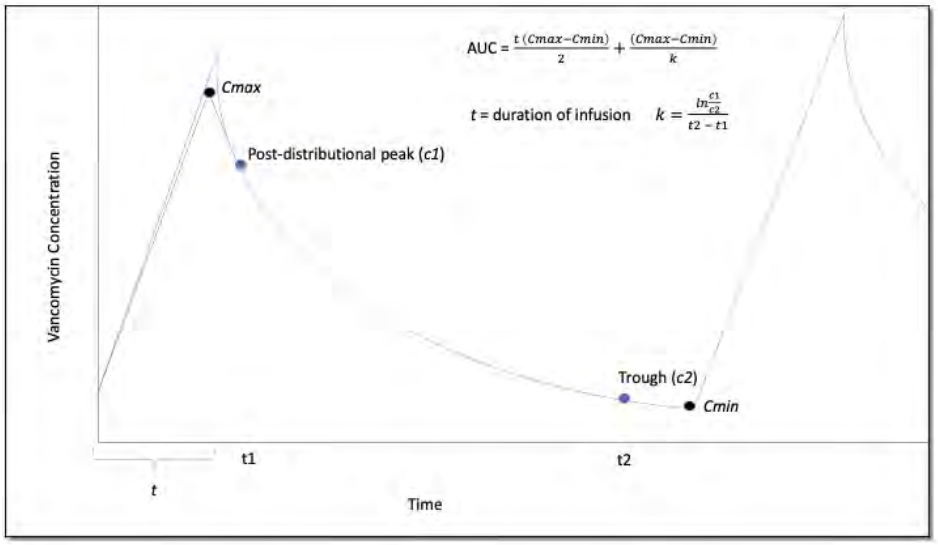


Figure 1. cI represents the post-distributional peak drawn for the purposes of this study. c2 represents the vancomycin trough concentration drawn in standard practice. Cmax and Cmin were extrapolated to estimate the true peak and true trough, respectively. The area under the curve (AUC) per dose interval can be calculated with the equation shown, however must be multiplied by the frequency of doses per day to obtain the AUC over 24 hours.

Data collection

Baseline pharmacist knowledge and confidence information was collected by survey administration. Survey questions were developed and approved by the project team (Table 1). Surveys were distributed by residents or pharmacists across three Ascension Wisconsin hospitals: Ascension St. Mary's Hospital, Ascension St. Clare's Hospital, and Ascension All Saints Hospital.

AUC assessment was completed at Ascension St. Clare's Hospital. Adult patients with consults for pharmacy to dose vancomycin were included in this study. Pregnant patients or patients receiving renal replacement therapy were excluded from this study. Under the current institutional vancomycin dosing and monitoring guidelines, pharmacists continued to perform trough-based dosing. An additional post-distributional vancomycin concentration was drawn to allow calculation of the AUC. Levels were ordered on the same dosing interval and prior to the standard trough level as concentrations approached steady state, often between the third and fourth doses of vancomycin therapy (Figure 1). Post-distributional levels were ordered at least one hour after the end of the previous vancomycin infusion to account for distribution. Post-distributional concentrations were suppressed from the electronic health record and directly reported to the primary investigator for analysis. Median and mean AUC were also collected for comparison to the literature.

Nephrotoxicity data was obtained via prospective chart review by the primary investigator. Concomitant nephrotoxic agents from vancomycin initiation to day 21 or termination of inpatient stay were also recorded. This and all other data gathered from the patient chart was predefined and done so prospectively, except for the following: patients who required a nephrology consult after experiencing nephrotoxicity.

Statistical methods and calculations

Due to a limited anticipated patient volume, we were unable to compare nephrotoxicity incidence between patients in and outside of goal AUC range. Our prespecified analysis instead targeted nephrotoxicity in our study population as a whole, with a published comparator trial to establish desired patient enrollment. Neely et al demonstrated an incidence of 8% nephrotoxicity in trough-monitored patients and 1.13% in AUC-monitored groups.[5] Using this as a historical comparator for AUC-based monitoring, we determined a required patient enrollment of 37 patients (alpha level of 0.05 and power of 80%). Fischer's exact test was used for this categorical data analysis. The Sawchuk-Zaske method was used to calculate the area under the curve.[9,16] Using the post-distributional vancomycin concentration drawn in addition to the trough concentration drawn, the estimated AUC over a dosing interval was calculated. This was then multiplied by the doses given in each 24-hour time period to obtain the total AUC. True trough and peak values over single dosing intervals were back-extrapolated using the same exponential curve equations. Additional post hoc analysis included reporting the percent of time AUC was either supratherapeutic, subtherapeutic, or therapeutic if the true trough was supra-, sub-, or therapeutic.

Results

There were 60 post-distributional peak levels drawn. The subsequent trough level was drawn 76.5% of the time. Therefore, a total of 46 AUC levels were calculated in 43 patients. The average patient age was 60, and the majority of patients were male and not admitted to the intensive care unit (Table 2). The average number of concomitant nephrotoxic agents administered to each patients was one. The most common of these were contrast dye, diuretics, and then piperacillin/tazobactam and ace inhibitors or angiotensin receptor inhibitors.

Baseline survey results

Of 28 survey respondents, almost 90% felt confident in trough-based dosing as compared to no respondents feeling confident (i.e. a "yes" to feeling confident) in AUC-based dosing (Table 1). The preferred kinetic measure for vancomycin efficacy was thought to be AUC/MIC by over half of respondents at 53.6%, and trough by 39.3% of respondents. The preferred AUC/MIC ratio associated with vancomycin efficacy was correctly identified as > 400 mg h/L by 71.4% of respondents. Vancomycin trough levels were thought to be associated with efficacy by 75% and associated with toxicity by 60.7% of respondents.

Primary Outcome

The percent of AUC levels within the desired therapeutic range was 39.1%

TABLE 3. Area Under the Curve Results

Subject Parameter	*Result, No. (%) unless otherwise specified*
AUC in therapeutic range, 400-600 mg h/L	18 (39.1)
Subtherapeutic AUC, <400 mg h/L	10 (21.7)
Supratherapeutic AUC, >600 mg h/L	18 (39.1)
Mean (+/-SD[a]) AUC, mg h/L	556.3 (195.1)
Median (IQR[b]) AUC, mg h/L	531.5 (204.5)
Therapeutic[c] trough	
True trough therapeutic, AUC therapeutic	7 (43.8)
True trough therapeutic, AUC subtherapeutic	1 (6.25)
True trough therapeutic, AUC supratherapeutic	8 (50)
Subtherapeutic[c] trough	
True trough subtherapeutic, AUC therapeutic	11 (52.4)
True trough subtherapeutic, AUC subtherapeutic	9 (42.9)
True trough subtherapeutic, AUC supratherapeutic	1 (4.9)
Supratherapeutic[c] trough	
True trough supratherapeutic, AUC therapeutic	0 (0)
True trough supratherapeutic, AUC subtherapeutic	0 (0)
True trough supratherapeutic, AUC supratherapeutic	9 (100)

[a]SD = standard deviation
[b]IQR = interquartile range
[c]Therapeutic trough range varied from 10-20 mcg/mL to 15-20 mcg/mL per indication

(N=18). The percent of AUC levels above therapeutic range was 39.1% (N=18), and the percent of AUC levels below therapeutic range was 21.7% (N=10). The percent of time AUC was either supra-, sub-, or therapeutic if the true trough was supra-, sub-, or therapeutic is reported in Table 3. Trough levels were within therapeutic range 34.8% of the time. If the true trough was therapeutic, the AUC was supratherapeutic 50% of the time. If the true trough was subtherapeutic, the AUC was therapeutic 52.4% of the time.

Incidence of nephrotoxicity among our study population was 16.3% (N=7). As compared to the historical control study selected, which demonstrated 1.13% nephrotoxicity in AUC-based dosing groups, our patient population experienced a significantly higher incidence of nephrotoxicity (p=0.0002). No patients presented with existing nephrotoxicity within the previous 72 hours or a baseline serum creatinine of greater than 2 mg/dL. In 4 of the 7 patients experiencing nephrotoxicity, the AUC was < 600 mg h/L and the trough was < 20 mg/L. All of these patients received either loop diuretics, piperacillin/tazobactam, non-steroidal anti-inflammatory drugs, contrast dye, or a combination of those agents during the relevant time period. In 3 of the 7 patients experiencing nephrotoxicity, the AUC was > 600 mg h/L and the trough was > 20 mg/L. Two of these patients received: either angiotensin-converting enzyme inhibitors or angiotensin receptor blockers; loop diuretics; piperacillin/tazobactam; acyclovir; contrast dye; or a combination of those agents during the relevant time period. Therefore, 6 of the 7 patients experiencing nephrotoxicity also received a concomitant nephrotoxic agent from day of vancomycin administration to day 21 or termination of inpatient stay. Two patients received formal evaluations by the nephrology service.

The comparator study used similar exclusion criteria to our project; both excluded patients with any type of renal replacement therapy. The comparator study also excluded patients with an expected survival of < 72 hours. They used the same definition of nephrotoxicity; however, they only included patients in their analysis if nephrotoxicity was thought to be more attributable to vancomycin than to another cause by their primary team. To replicate this, we controlled for those patients with an AUC < 600 mg h/L and a trough < 20 mg/L, assuming these patients were less likely to have vancomycin as the primary cause of nephrotoxicity. The remaining 3 patients were not admitted to the critical care unit during the study period, perhaps reflecting that those patients would have a longer expected survival and a similar acuity to patients in the historical control study. When controlled for these factors post-hoc, our patient population did not experience significantly higher nephrotoxicity versus the AUC-based dosing group of the comparator study, (7% vs 1.13%, p=0.0524).

Secondary Outcomes

One patient required escalation of therapy to an alternate MRSA active antimicrobial, ceftaroline. In this case, the culture reported susceptibility to vancomycin with MIC=1. The calculated AUC was 615 mg h/L and true trough was 17.8 mg/L. Escalation was attributed to clinical failure of vancomycin.

The average AUC value in our population was a mean of 556.3 mg h/L (SD 195.1) or a median value of 531.5 mg h/L (IQR 204.5). Two AUC values were excluded from this calculation. The excluded values were determined to be over 600 mg h/L; however, the exact AUC was not able to be calculated due to the post-distributional peak obtained being reported as > 50 mcg/mL instead of an exact value.

Discussion

We found that the majority of AUC levels obtained during trough-based dosing were outside of the desired 400-600 mg h/L goal range. We also demonstrated that a therapeutic trough predicted a

therapeutic AUC less than 50% of the time, and that a therapeutic AUC was actually more likely to be obtained with a subtherapeutic trough result. The results of this small, single-center analysis align with many previously published reports. It is useful to compare our outcomes to several comparator trials.

While Neely et al reported 75% of patients within AUC/MIC target range with trough-based dosing, they used a target AUC range of 400-800 mg h/L.[5] This is difficult to compare to our study, which used the well-established goal range of 400-600 mg h/L. Finch et al, however, did examine the median AUC among its study groups. Our median AUC was 531.5 mg h/L (IQR 204.5) as compared to 471.5 (361.5–576.7) reported in their AUC-based dosing group.[7] Notably, our reported median AUC also excluded two outlier AUC values. In each of these cases, the AUC was supratherapeutic but could not be calculated due to post-distributional peaks above the assay range. This suggests our median AUC values are higher than those seen in AUC-based dosing.

We also found a relatively high incidence of nephrotoxicity, confounded by the administration of multiple additional nephrotoxic agents. Our study reported the same median number of concomitant nephrotoxins as Finch et al at one per patient over the duration of the study period, but produced a higher incidence of nephrotoxicity.[7] As compared to Neely et al, our trough-based dosing produced a nephrotoxicity incidence of 16.3%, higher than the 8% reported in their trough-based dosing groups, and also significantly higher than the 1.13% total reported in AUC-based dosing groups.[5]

Considering the high rate of concomitant nephrotoxins administered to our patients, it is difficult to attribute the nephrotoxicity seen in this study to vancomycin alone. Six of the 7 patients received at least one concomitant nephrotoxic agent during the study period. Of those 7 patients who met our definition of nephrotoxicity, only 3 also met the parameters for supratherapeutic trough or AUC. When our data was controlled to reflect nephrotoxicity most likely attributable to vancomycin, there was no longer a significant difference seen compared to AUC-based dosing groups reported in Neely et al.

The baseline pharmacist knowledge and confidence survey demonstrated a high level of confidence in trough-based dosing ability, and a lack of confidence in AUC-based dosing ability. Not all pharmacists were able to choose the correct target AUC/MIC range or other measures related to AUC-based monitoring. Similar to the unfamiliarity reported in the recent survey by Kufel et al, this suggests a common barrier to implementation of AUC-based dosing across sites.[11] Other barriers to implementation might include the increased resources required for this method, including collection and processing of two vancomycin concentrations versus one.

There are additional similarities and differences to consider between our patient population and those in previously published reports. As compared to Neely et al, our mean patient age was older, at 60.6 years old, compared to 47.7 years old in their trough-based dosing control group, and averages of 48 and 50.3 years old in their AUC-based dosing groups each year.[5] Compared to Finch et al, however, our mean patient age was comparable to their trough-based dosing group; their mean patient age was 59.1 years, while the mean age of their AUC-based dosing group was 50 years old.[7] Our study also contained a lower proportion of males, at 63.8% versus 75-81% reported in Neely et al, but a higher proportion of males compared to the 54.2% and 56.4% reported in Finch et al.[5,7] Our average weight was higher than both comparator trials with 85.6 kg, compared to averages of 78.8-82.4 and 66-67.9 kg. Our project had a comparable average height to Neely et al at 171 cm versus their averages of 169.1-171.9 cm.[5,7] Our average baseline serum creatinine was 0.9 mg/dl compared to averages of 0.82-0.84 and medians of 0.9 reported in the same studies.[5,7]

There are several limitations to our findings. Considering the small sample size, it was not feasible to compare nephrotoxicity incidence between those patients who did or did not attain goal AUC levels. Therefore, we instead compared our nephrotoxicity incidence to a published comparator trial, which is less robust. While many of our selection criteria were similar, we were not able to exactly replicate all aspects of the comparator trial. While we did further control our data to match the methods of Neely et al, this was done post-hoc. Our limited sample size also restricted our ability to calculate the significance of our primary results, including percent of AUC levels within the desired range as well as in relation to trough level obtained. As mentioned, the majority of patients experiencing nephrotoxicity in our study also received a concomitant nephrotoxin, which limits the conclusions able to be drawn from these results. Another limitation is the conflicting results of the pharmacist knowledge and confidence survey. While only 53.6% of respondents identified the preferred kinetic measure as AUC/MIC, over 70% of pharmacists correctly identified the goal AUC/MIC target for efficacy. This suggests some baseline concerns with the survey itself.

One notable area of interest within our data includes the inability of trough levels to accurately predict the calculated AUC. This is consistent with previous reports of inconsistency between trough levels and expected AUC values.[2] Our trough levels were therapeutic 34.8% of the time, as compared to 28% reported in the trough-based dosing arm of Neely et al.[5] This might indicate that our initial achievement of trough goals is comparable to other institutions. Despite this, these trough levels do not appear to always correlate with the desired AUC values. In our population, a subtherapeutic trough level was more likely to predict a therapeutic AUC than a subtherapeutic AUC. This again correlates to previous comparator studies. When Neely et al transitioned from trough-based dosing to AUC-based dosing, their average troughs decreased without a difference in reported efficacy.[5] Additionally, this causes us to wonder whether we are placing our patients at a higher risk of nephrotoxicity with no added benefit.

Conclusion

The results of this small prospective analysis are applicable to institutions with similar dosing schemes and patient populations. This project attempted to evaluate the area under the curve as well

as nephrotoxicity seen in our trough-based vancomycin dosing and monitoring process. The results suggest that trough-based dosing might not achieve the desired AUC in all cases. A high incidence of nephrotoxicity was confounded by administration of concomitant nephrotoxic agents. Future directions include exploration of AUC-based dosing; however, the baseline pharmacist knowledge and confidence data must be taken into account as well. It will be important to ensure proper education and training to ensure pharmacists are confident in this new method if implemented.

At the time of writing, Alanna Ambrosius is a PGY-1 Pharmacy Practice Resident and Kent Cook is a Clinical Lead Pharmacist at Ascension St. Clare's Hospital in Weston, WI. Jim Davis is an Antimicrobial Stewardship Pharmacist and Justin Guthman is the Regional Director of Pharmacy for the Ascension Wisconsin, Northern Region.

Disclosure: The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, employment, gifts, and honoraria.

The primary author had full access to all data and takes responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. Rybak M, Lomaestro B, Rotschafer JC, et al. Therapeutic monitoring of vancomycin in adult patients: a consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. *Am J Health Syst Pharm.* 2009;66(1):82-98.
2. Hale CM, Seabury RW, Steele JM, Darko W, Miller CD. Are vancomycin trough concentrations of 15 to 20 mg/L associated with increased attainment of an AUC/MIC ≥ 400 in patients with presumed MRSA infection? *J Pharm Pract.* 2017;30(3):329-335.
3. van Hal SJ, Paterson DL, Lodise TP. Systematic review and meta-analysis of vancomycin-induced nephrotoxicity associated with dosing schedules that maintain troughs between 15 and 20 milligrams per liter. *Antimicrob Agents Chemother*. 2013;57(2):734-744.
4. Chavada R, Ghosh N, Sandaradura I, Maley M, Van Hal SJ. Establishment of an AUC 0-24 threshold for nephrotoxicity is a step towards individualized vancomycin dosing for methicillin-resistant Staphylococcus aureus bacteremia. *Antimicrob Agents Chemother.* 2017;61(5):e02535-16..
5. Neely MN, Youn G, Jones B, et al. Are vancomycin trough concentrations adequate for optimal dosing? *Antimicrob Agents Chemother*. 2014;58(1):309-316.
6. Aljefri DM, Avedissian SN, Rhodes NJ, Postelnick MJ, Nguyen K, Scheetz MH. Vancomycin area under the curve and acute kidney injury: a meta-analysis. *Clin Infect Dis.* 2019;69(11):1881-1887.
7. Finch NA, Zasowski EJ, Murray KP, et al. A quasi-experiment to study the impact of vancomycin area under the concentration-time curve-guided dosing on vancomycin-associated nephrotoxicity. *Antimicrob Agents Chemother*. 2017;61(12).pii:e01293-17.
8. Rybak MJ, Le J, Lodise TP, et al. Therapeutic monitoring of vancomycin for serious methicillin-resistant Staphylococcus aureus infections: a revised consensus guideline and review by the American Society of Health-system Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists [published online. 2020 Jul 13]. *Clin Infect Dis.* 2020;ciaa303. doi: 10.1093/cid/ciaa303.
9. Pai MP, Neely M, Rodvold KA, Lodise TP. Innovative approaches to optimizing the delivery of vancomycin in individual patients. *Adv Drug Deliv Rev.* 2014;77:50-57.
10. Turner RB, Kojiro K, Shephard EA, et al. Review and validation of bayesian dose-optimizing software and equations for calculation of the vancomycin area under the curve in critically ill patients. *Pharmacotherapy.* 2018;38(12):1174-1183.
11. Kufel WD, Seabury RW, Mogle BT, Beccari MV, Probst LA, Steele JM. Readiness to implement vancomycin monitoring based on area under the concentration-time curve: a cross-sectional survey of a national health consortium. *Am J Health Syst Pharm*. 2019;76(12):889-894.
12. The Diagnostic and Treatment Center: Clinical Microbiology Division. Report of prevalent pathogens and antimicrobial susceptibility patterns January 1, 2018 to December 31, 2018. Weston, WI: The Diagnostic and Treatment Center; 2019.
13. Vancomycin dosing and monitoring guidelines 2017. Ministryhealth.net. http://intranet.ministryhealth.net/Files/Affinity-Health-System/Departments/Pharmacy/VancomycinDosingandMonitoring2017.pdf. Published 2017. Accessed September 1, 2019.
14. Naughton CA. Drug-induced nephrotoxicity. *Am Fam Physician.* 2008;78(6):743-750.
15. Nolin TD, Himmelfarb J, Matzke GR. Drug-induced kidney disease. In: Pharmacotherapy. 6th ed. New York: McGraw-Hill; 2005;871-887.
16. Dosing guides. Stanford antimicrobial safety & sustainability program website. http://med.stanford.edu/bugsanddrugs/dosing-protocols.html. Accessed July 28, 2019.

Pharmacy Quality™ COMMITMENT+

A continuous quality improvement program can be a lifesaver!

MAKE YOUR PATIENTS AND YOUR PHARMACY SAFER.

FOR LESS THAN A DOLLAR A DAY ...

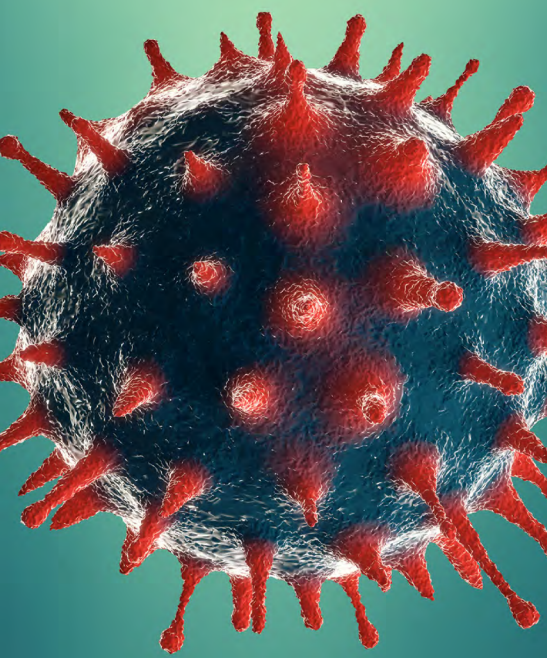
- Increase patient safety – learn from collected safety data and online resources
- Maintain compliance – meet accreditation, credentialing, PBM and state QA requirements
- Reduce costs – increase operations efficiency, reduce potential risk and cut down on "re-do" Rxs
- Safeguard your data – Patient Safety Organizations offer confidentiality and legal protection

APMS
Alliance for Patient Medication Safety

Learn more at www.medicationsafety.org or call us at (866) 365-7472.
The Alliance of Medication Safety (APMS) is a federally listed Patient Safety Organization (PSO).

Pharmacists Combating COVID-19

by Megan Grochowski, 2021 PharmD Candidate



The unpredictable year of 2020 has been a series of rapidly changing events that will fill our history books and have great impacts on society's future. On March 11, 2020, the World Health Organization declared COVID-19 a global pandemic. The world has already experienced virus outbreaks and pandemics, so why has COVID-19 caused such strain? World governments attempted to address unknown questions to calm nerves. Healthcare professionals of all specialties scrambled to come together and find answers to protect their communities. Craig Grzendzielewski (PharmD, MBA, BCPS), the Director of Pharmacy at Aurora St. Luke's South Shore, Jeffrey Zimmerman (PharmD, BCPS), the Director of Pharmacy Services at Aurora Sinai Medical Center, and Nick Ladell (PharmD, MBA, BCPS), the Director of Pharmacy Services at Aurora West Allis Medical Center have all played instrumental roles with their institutions' COVID-19 incident management teams.

Day to Day

For Dr. Grzendzielewski, his work had changed significantly since the beginning of the pandemic. As expected, COVID-19-related responsibilities consumed most of the day, in addition to regular duties. To prepare for the unknown and anticipated surge of patients, the incident command team (ICT) met daily, including on weekends. Dr. Grzendzielewski's time with the ICT was dedicated to ensuring that parameters regarding personal protective equipment (PPE) and COVID-19 patient admission and testing processes were prepared. Time was also spent figuring out the logistics of details such as cafeteria seating, drinking fountain use, and how people would use shared spaces throughout the facility. The top priority, however, was overall safety of both patients and staff, all while providing exceptional patient care. Communication with department leaders and staff was the key to the successful implementation of new procedures. A few months into the pandemic, as the changes have become a little less frequent, Dr. Grzendzielewski and his team have been able to scale back on time required to meet.

Dr. Ladell and his team also went to great lengths to protect the hospital staff and patients. Due to the frequent and complex changes near the beginning of the pandemic, senior ICT leaders met in what he referred to as the "War Room." Here, they were able to thoroughly discuss changes, take on the day's new challenges, and implement new procedures, which included testing and isolation practices.

Dr. Zimmerman acted as the liaison officer on the ICT and relayed important information from site to site. In the peak of the pandemic, the ICT was meeting for about one to three hours each day to discuss new daily challenges.

The biggest practice change was the transition to remote patient care. Practice itself remained unchanged; however, the workflow and delivery of that care were vastly different. To minimize the risk of exposure and spread of the virus, certain tasks were identified to be conducted virtually, including medication histories and patient education. Also, when able, some pharmacy staff performed their duties from home. Due to the shortages of PPE, adjustments of its use, especially in sterile compounding spaces, were made to stretch the supply. Dr. Grzendzielewski stated that, "The whole goal of these changes was to continue to provide the same level of care we always have but reduce the risk of potential COVID exposure for our staff."

Raising the Bar

Since the pandemic began, the pharmacist's role has not changed--only how they provide their services. Pharmacists have dedicated their professional careers to ensuring that patients receive the best pharmacologic therapy. Pharmacists were crucial in educating other healthcare providers and the public about new and emerging COVID-19 treatment recommendations, especially with the numerous questions regarding medications such as hydroxychloroquine, remdesivir, and tocilizumab. The treatment of this disease, especially during its early stages, had very limited data, and recommendations had shifted numerous times. It was in these instances that pharmacists played an instrumental role in ensuring patients received the most appropriate treatment.

Dr. Grzendzielewski highlighted that

Above: *Jeffrey Zimmerman, PharmD, BCPS from Aurora Sinai Medical Center.*

pharmacists have a unique skill set that incorporates "high clinical knowledge, as well as high levels of critical thinking skills, and creative problem solving." These diverse characteristics allowed pharmacists to be trusted with non-traditional roles during the pandemic. Inclusion of pharmacists on hospital ICTs shows that pharmacy professionals are influential and needed for the management of COVID-19.

Bumps in the Road

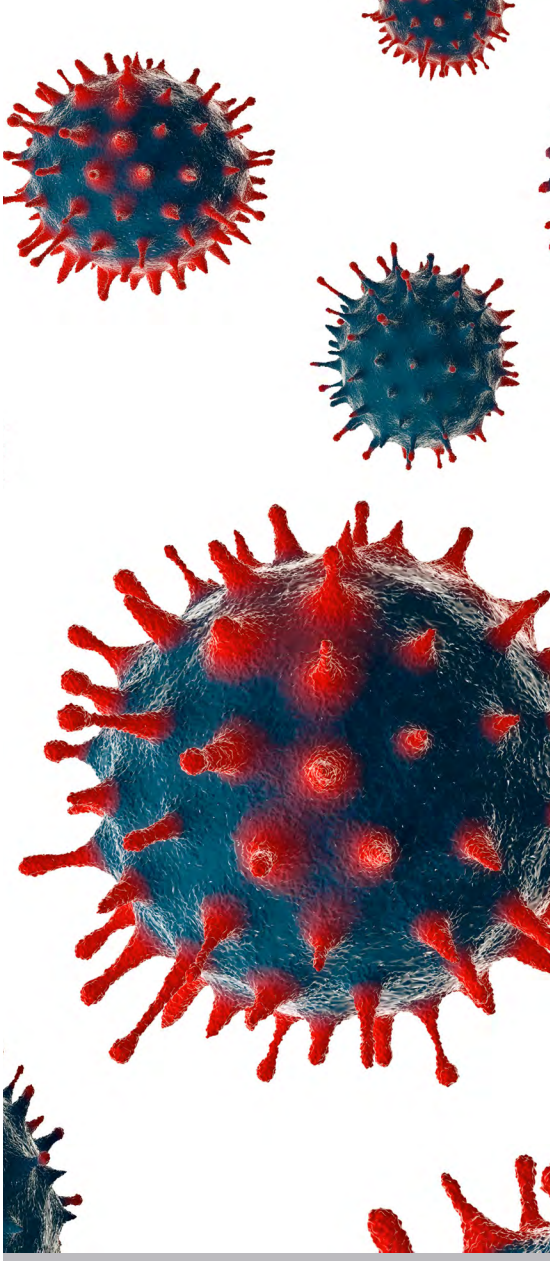
Stress from the uncertainty of the pandemic appeared to be a common trend for all. Whether it was based on concern about contracting the disease or spreading it to loved ones, the ICT ensured that the hospital's employees were protected with PPE, stayed remote when possible, implemented appropriate distancing, and had frequent communication with one another. They found that focusing on perseverance, resilience, raising awareness of mental health challenges, and having support for one another had significant impacts on overcoming stressful obstacles. The lack of face-to-face interaction with patients also posed a challenge. With tasks being completed virtually, the pharmacy staff missed having bedside interactions with patients. "[The pandemic] also has certainly highlighted the importance of staying up-to-date on treatment recommendations," Dr. Grzendzielewski pointed out. As we know, the information about COVID-19 is continuously changing, so knowing and understanding the latest treatment recommendations proved to be a big challenge for not only pharmacists, but for all healthcare providers.

Having exceptional communication with the healthcare team is pertinent when a topic has newly developed information and data coming out daily. Advocate Aurora's health system has made great efforts in communicating the latest information and releasing up-to-date treatment guidelines to all hospitals through staff huddles, weekly updates, and more. This has been incredibly helpful to ensure that all facilities are on the same page and that all positive COVID patients are receiving the most recent evidence-based treatment.

Moving Forward

Whether we want to believe it or not, we are all living through trying, unprecedented times. Being resilient and embracing the new everyday challenges will make pharmacists stronger healthcare professionals. Now more than ever, patients trust pharmacists to provide them with the best recommendations. Pharmacists are the medication experts, and although the information about COVID-19 is not exactly "black and white," healthcare providers need to be able to provide care in the "gray."

Finding ways to have a healthy work/life balance to overcome stress outside of the workplace is essential to ensuring that pharmacists can invest energy into providing optimal care for their patients. Unwinding, de-stressing, and finding the positives in our current world will help keep pharmacists working at their top potential. Finding the positives during a pandemic might seem like a difficult task; however, there have been many positive outcomes, such as the increase in virtual health services. The rapid advancements that telehealth had to make proves that both pharmacy and healthcare have great potential to progress even further and open the door to future opportunities.



Below: *Craig Grzendzielewski, PharmD, MBA, BCPS from Aurora St. Luke's South Shore*

Megan Grochowski is a 4th Year Doctor of Pharmacy Candidate at the Medical College of Wisconsin School of Pharmacy in Milwaukee, WI.

Disclosure: The authors declare no real or potential conflicts or financial interest in any product or service mentioned in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

UNIVERSITY OF WISCONSIN-MADISON SCHOOL OF PHARMACY STUDENT WRITING CLUB:

Pharmacy Leadership Spotlight: Andrew Wilcox

by Tyler Albright and Samantha Lewiston, 2021 PharmD Candidates

Andrew Wilcox, Chief of Pharmacy at the William S. Middleton Memorial Veterans Hospital (Madison VA), is an integral part of the pharmacy leadership community both in Madison and across the state of Wisconsin. Andrew came to UW-Madison as an undergraduate with a passion for healthcare and a goal of giving something back. At student orientation, Andrew spoke with the UW-Madison School of Pharmacy advisor, Joann Pritchett, and began attending pre-pharmacy club meetings, which grew into a leadership role within the organization. Andrew then applied for and became part of the first Doctor of Pharmacy class at the UW-Madison School of Pharmacy. While in the pharmacy program, he became a decentralized pharmacy technician at UW Hospital and was exposed to different roles within pharmacy. Working with students, residents, and pharmacists opened his eyes to potential pharmacy opportunities and was formative in determining the direction of his future career path. During pharmacotherapy skills lab, Andrew became impressed with the knowledge and scope of practice of the Madison VA residents and decided to pursue a VA residency.

After graduation, Andrew completed a VA residency under Art Schuna and took an ambulatory care pharmacy position at the Rockford VA Primary Care Clinic. It was here that Andrew further developed his clinical knowledge and expanded his interprofessional experiences. He then attended the Leadership Conference held by the Pharmacy Society of Wisconsin (PSW) and the Iowa Pharmacists Association. This increased his awareness of the challenges and opportunities of pharmacy practice as a whole, well beyond the primacy care niche where he practiced. After reflection, Andrew knew his passion was to become an advocate for the pharmacy profession and be part of solutions to healthcare challenges. After 6 years in Rockford, Andrew became Assistant Chief of Pharmacy at the Madison VA. Three years later, he began his current position as the Chief of Pharmacy.

Development

Andrew credits much of his success to his peers, mentors, and leadership programs. He especially noted that "mentors are critical through your entire journey." Andrew considers the School of Pharmacy, PSW, UW Health pharmacy staff and VA residents to be early influences on his career. Chris Sorkness and Denise Pigarelli played significant roles during pharmacy school and residency to inspire Andrew and help hone his career pathway. Andrew was quickly and permanently inspired by Chris Decker during his fourth year of pharmacy school on a PSW clerkship rotation to be a difference maker and pharmacy leader.

Art Schuna, Andrew's Residency Program Director at the Madison VA, had a tremendous impact on his growth. With a "sink or swim" mentality, Andrew was forced to quickly become independent while having the authority to prescribe during his residency. He was pushed to improve clinical, time management, interpersonal, and leadership skills.

Andrew also praises two programs which helped him transform into the leader he is today. First was the PSW Leadership Conference that he attended while working in Rockford. This provided a great experience to see what pharmacy was struggling with on a grand scale and the numerous opportunities for newer pharmacists to engage and step-up as leaders. Then, as Assistant Chief of Pharmacy at the Madison VA, Andrew further developed his technical and soft skills as a manager through the American Society of Health-System Pharmacists Foundation's Pharmacy Leadership Academy.

Accomplishments

As Pharmacy Chief, Andrew is currently responsible for pharmacy programs spanning the outpatient, ambulatory care and inpatient settings. He currently serves on the Veterans Health Administration Clinical Pharmacy Advisory Board, PSW Practice Advancement Leadership Team and the PSW Health-System Advisory Board. In 2019, Andrew was presented with the PSW's Pharmacist of the Year Award. This award, presented to an individual who has made significant, influential and sustained contributions to pharmacy practice and patient care, was a crowning achievement for Andrew, as well as an opportunity for him to reflect on and share his personal journey to where he is today. Looking back on his career thus far, Andrew states he never would have imagined this path for himself back in pharmacy school. He is thankful for the self-reflection, mentors and training programs that have helped him achieve these successes.

Future Leadership Directions

Andrew is hopeful for the future of Wisconsin pharmacy leadership while others worry of an impending national shortage of pharmacy leaders. While he acknowledges challenges such as disruptors in retail pharmacy and fewer applicants to pharmacy schools, he believes the investments made by pharmacy schools and the PSW in leadership training and development will pay off. This is especially key given the leadership expectations within Wisconsin pharmacy practice. "Excellence in pharmacy services is a goal and expectation," Andrew says. "It's ingrained in the Wisconsin pharmacy culture that leadership is the expectation." Andrew credits a long line of exemplary pharmacy leaders in Wisconsin who have developed and maintained this standard.

Andrew seeks to mentor the next generation of Wisconsin pharmacy leaders in his role as a Residency Program

Director for the Health-System Pharmacy Administration and Leadership residency at the Madison VA. He states that being in the preceptor role, working with students and residents, and helping learners achieve excellence gives back to the preceptor immensely and aligns with why he got into the pharmacy profession: to help others. Andrew states that he missed such a connection with learners during his time as a clinical pharmacy specialist in Rockford, IL. This drove him to his current role where, as he puts it, *"I can be challenged and pushed, and we have a sheer commitment to the growth and success of each other. You can't ask for much better than that. It's tremendous. It's been something I have been extremely proud of and will continue to invest in."*

Tyler Albright and Samantha Lewiston are 4th Year Doctor of Pharmacy Candidates at the University of Wisconsin-Madison School of Pharmacy in Madison, WI.

Above: *Andrew Wilcox (right) receiving his Pharmacist of the Year Award from PSW President Mike Gillard (left) at the 2019 PSW Annual Meeting.*

REGISTRATION OPEN UNTIL DECEMBER 31, 2020

Homestudy content available for continuing education credit

Finding Your Fit: Your Professional Home in Pharmacy

2020 Virtual PSW Technician Educational Forum

2020 Annual Meeting Recap

by Kristin Hesselbach, 2021 PharmD Candidate

More than 300 technicians, students, and pharmacists gathered for the first-ever virtual PSW Annual Meeting, which ran from August 26 through August 28. Attendees had access to more than 16 hours of pre-recorded sessions in addition to the usual three days of engaging live sessions. Once registered, members had the opportunity to peruse online content as it fit into their schedules before the meeting even started. Topics were vastly applicable to Wisconsin pharmacies in this novel time with COVID-19. The conference offered up ways for pharmacists and technicians to successfully navigate this landscape while keeping their patients at the core of their attentive care, minimizing burnout, and practicing at the top of their profession.

In the session Promoting Patient Access through Pharmacist Provider Status, Dr. Nick Olson, past president of PSW and Manager of Ambulatory Pharmacy at Froedtert Health, described the impact of pharmacists being added to the list of Medicaid providers. With this addition, pharmacists would receive well-deserved compensation for patient care services under the medical benefit. He discussed the intriguing juxtaposition of provider status versus prescriber status, and how reaching provider status is critical to increasing our patients' access to care, including immunizations, point-of-care testing, or comprehensive medication reviews, for example.

In another pre-recorded continuing education (CE) session titled Establishing an Ambulatory Care Practice, Dr. Francesca Napolitano described her path to creating an ambulatory pharmacist role at Progressive Community Health Centers. She identified reaching out to different providers and staff currently at the site for buy-in as an important step to establishing her role at the practice. She also encouraged pharmacists to research their respective sites to analyze how they use outcome measures to justify services. Dr. Napolitano created a fantastic resource for current and future pharmacists interested in starting up or expanding ambulatory care services at their sites. Other online pre-recorded CE content addressed Phar 7 regulatory changes, COVID-19 point-of-care testing, considerations with cultural awareness in treatment plans, and population health management.

Live programming kicked off the evening of Wednesday, August 26 with virtual networking and topic discussions. From Coping with COVID to Working from Home and Schooling from Home—Surviving as a Pharmacist Parent to the welcome happy hour, there was a community for conversation for everyone. On Thursday the 27th, the day kicked off with the PSW Get up and GO!, which featured photos and posts from conference attendees around the state staying active. Then came the first general session of the meeting, the Welcome & PSW Membership Briefing, where PSW President Dr. Mike Gillard and PSW Executive Vice President and CEO Dr. Sarah Sorum discussed being bold, being authentic, and being empathetic. Now more than ever, pharmacists, pharmacy technicians, and student pharmacists are in a position to be compassionate, empathetic leaders in the field of healthcare, and we have the opportunity to show our patients that we are listening. Dr. Gillard and Dr. Sorum recognized the incredible work around the state that is already being done in the name of patient advocacy, and highlighted how future provider status approval would set pharmacists up for more sustainable success. Also mentioned were the expansion of pharmacy technician careers with the development of career ladders and how pharmacies will be involved with the provision of the COVID-19 vaccine in the future.

The next live session of the day featured Dr. Thomas Dilworth, Infectious Diseases Specialty Pharmacy Coordinator and PGY2 Infectious Diseases Pharmacy Residency Director at Advocate Aurora Health, and Dr. Lucas Schulz, Infectious Diseases Clinical Coordinator at UW Health. The talk was titled Updates in Our Battle Against Coronavirus and in the Treatment of COVID-19. Being infectious disease experts, this dynamic duo detailed what we know so far about the mechanism of

COVID-19 infection. They then explicated past, current, and possible future treatment modalities focused around evidence-based studies and their composite results. Dr. Dilworth and Dr. Schulz further went on to discuss risk versus possible benefit scenarios of vaccinations that are currently in development. Extremely important to this discussion was the concept of vaccine hesitancy. The speakers emphasized how premature vaccination of the general population coupled with poor vaccine efficacy might cause distrust in the benefits of immunization and put communities at risk for low compliance when higher quality vaccines reach the market. Further discussion in the session revolved around the differences in current COVID-19 tests and testing practices.

As lunchtime approached, conference-goers passed through the "Hallway" Conversations Zoom to catch up and network before visiting the Lunch and Learn by Incyte on the topic of Pemazyre (Pemigatinib): The First and Only Treatment for Locally Advanced or Metastatic Cholangiocarcinoma. This was followed by the Exhibit Showcase featuring 27 different virtual booths on topics ranging from tobacco cessation to diabetes, hematology, oncology, and many more. Booth visitors could virtually connect through video chat lines with hosts to discuss new treatment modalities and results of emerging clinical studies.

Afternoon programming included the Health-System Pharmacy Leadership Forum: Adapting the Health-System Pharmacy Enterprise Post COVID-19 Response. Students, technicians, and pharmacists engaged in breakout sessions that covered flexible staffing and change management, telehealth and ambulatory care, virtual precepting, drug supply shortages, site of care challenges, and clinical decision support with informatics. This format allowed for very unique conversations with contributions from many different points of view, and often, many different solutions were provided to shared roadblocks in provisions of care to patients.

The evening concluded with the PSW Awards Presentation, featuring awards for Pharmacist of the Year, the Distinguished Service Award, the PSW Interdisciplinary Care Partner Award, Young Pharmacist of the Year, Bowl of Hygeia, Curtis Johnson Award, WPQC Engagement Award, WPQC Innovation Award, Excellence in Innovation, Pharmacy Technician of the Year, and Student Achievement Awards.

Friday morning began with expansive networking opportunities. With session topics covering telehealth services, virtual precepting, leadership and professional development, and ambulatory care. The first general program of the day was The Impact of Systemic Racism on Health and Health Care Systems in Wisconsin given by Dr. Tito Izard, President and CEO of Milwaukee Health Services Incorporated. Dr. Izard defined healthcare disparities specifically in Wisconsin and discussed how, as healthcare professionals, we cannot turn a blind eye to these inequities. Instead, he challenged members of the pharmacy community to work to correct these gaps in care by being advocates for patients in underserved populations. Pharmacists, pharmacy technicians, and student pharmacists are incredibly accessible to patients, and as such, we must lead by example to help engage the rest of the healthcare community.

Dr. Mike Gillard followed up next with his transitioning remarks and installation of the new PSW board. AstraZeneca and Paradigm then led Exhibit Theater Lunch and Learns on coronary artery disease and influenza management, respectively. In the afternoon, students and pharmacists came together to present more than 20 different topics in the annual Poster Session where attendees could visit with the researchers and presenters to see their work and ask questions.

Given the unique virtual platform, the Residency Showcase was unlike any previous year. Students had the chance to meet one-on-one with residents and program directors in 10-minute time slots to discuss program specifics, answer questions, and make personal connections. These closed-room sessions were then followed up by a half-hour of open meeting rooms for students to pass through additional programs to continue networking. For pharmacists and technicians not attending the aforementioned programs, there were also sessions for attendees to meet the PSW board, meet the speakers, discuss opioid stewardship and pain management, and review PSW engagement opportunities.

Annual Meeting 2020 was a resounding success that adapted to the current online landscape and proved that the pharmacy community will continue to serve our patients in the best capacity possible no matter the circumstances.

Kristin Hesselbach is a 4th Year Doctor of Pharmacy Candidate at the University of Wisconsin-Madison School of Pharmacy in Madison, WI.

2020 Presidential Address

by Melissa Theesfeld, PHarmD

Good morning, everyone, and thank you for taking time to tune in to this first-ever "virtual" presidential address. I am honored to be your PSW president and to represent the pharmacists, technicians, and students of our profession across all practice settings in Wisconsin. I have to admit that when Matt Mabie first called me last summer to tell me the results of the PSW presidential election, I was pretty nervous. One of the first thoughts that went through my head was, "What if I trip going up the stairs to the stage to give my speech?!" Luckily, I guess,COVID-19 has solved that problem for me and virtual meetings mean that I don't have to worry about getting up on a stage right now…I just have to stay put in front of my camera and hope the lighting is okay! The next thought that went through my head was, "What on earth am I going to talk about?!" COVID-19 and all of the other significant events of 2020 have, I guess, also taken care of that for me! The first eight months of 2020 have certainly given us much to talk about, healthcare workers and as a society. It's almost hard to remember life when we didn't know what "flatten the curve" and "social distancing" meant. Every aspect of our professional and personal lives has been upended. Virtual teaching and learning for our kids, virtual healthcare visits for our patients, and virtual professional meetings are the new norm in our COVID-19 world. Like all of you, I wish we could be together in person at the Kalahari Resort to learn, network, and socialize in person, like we have for so many years previously. We all know as healthcare providers that it's the right decision for us to gather virtually right now. But that doesn't mean it's an easy pill to swallow.

As the COVID-19 pandemic enveloped the globe, we got used to hearing about the need to "pivot." And while we are probably all tired of hearing that word by now, it's a good word to use when you think about our work. When you look up "pivot" in the dictionary, you'll find that it means "to turn on or about." Perhaps that's a fitting description of what we've all experienced in our practices over the last few months. The challenge that I have with the word "pivot" is that it implies a fixed central point that we are just moving around. I picture Ross Gellar from Friends, and basketball players spinning around a court in my mind every time I hear that word! As we begin to consider what a world with COVID-19 looks like, we need to think about how we are going to deliver healthcare and function as healthcare providers in the future. Almost everything we do as pharmacy professionals has just been upended by the COVID-19 pandemic, and we are working completely differently. All of our practices have been transformed. Every day, sometimes every hour, we learn more about the novel coronavirus, its treatment, and its potential long-term effects. And as we learn, we transform our established policies and procedures to incorporate this new information. Tom Johnson even used the word "transform" in his recent ASHP presidential address. "Transform," in my opinion, is the best description of what we are experiencing in our profession when you consider its definition: "to make a thorough or dramatic change in the form, appearance, or character." We have new ways of staffing our hospitals and pharmacies, providing medications, and interacting with our patients. We have transformed every aspect of our work to ensure that patients get the care that they need in the safest manner possible.

When it comes right down to it, the reason many of us entered the profession of pharmacy was to take care of patients. We are some of the most accessible healthcare providers, and patients rely on us for information about their medications, over-the-counter products, their overall health concerns, and sometimes just gossip from around the community. The people that you see here [on the slide] are my friends and family members. All of them, in some way, have been patients in the healthcare system that we all practice in. Some had simple treatments and recovered completely; others have complicated drug regimens or long courses of therapy. These are the people who motivate me to be a good pharmacist and to help other pharmacy professionals have the resources they need to practice at the top of their license. All of them had healthcare providers who impacted them as patients, but who also impacted me, as that patient's family member and friend. They are my constant reminder that every patient is also a real person who is scared, nervous, and needs an advocate. My husband, Shawn, has been that patient more times than he

(or I!) would care to acknowledge. From minor broken bones to major accidents and injuries, we have navigated many healthcare systems in southeast Wisconsin. Even for someone trained as a pharmacist who has a pretty good understanding of how healthcare works, advocating for patients and the care that they need is tough and time-consuming. And it's even more challenging in a COVID-19 world when offices are no longer routinely open and telehealth visits on your home computer are what make a patient-provider relationship. The patients that we care for don't all have the understanding and health literacy to be successful in a complicated, acronym-filled healthcare setting. And that's why they need us—the pharmacists and technicians in their communities—to be accessible, trusted resources.

I have met many of you in recent years, but I also know that there are many who don't know me very well. I went to high school in Rhinelander, Wisconsin and am a proud Hodag, although moving to small-town Rhinelander from big-city Atlanta, Georgia certainly had its challenges as a freshman in high school! I chose to go to college at UW-Madison and joined the marching band there. Being a member of the Badger Band transformed my college experience. I remember calling my mom two weeks after she dropped me off in Madison and saying, "Mom…I'm going to Las Vegas this week with the Band!!" Needless to say, she wasn't quite as excited as I was and was far more concerned about the classes I was going to miss. I had no idea what I was really getting into when I joined the Badger Band, but those 300 people quickly became my family as we spent three hours a day together at rehearsal and countless more hours together at Badger sporting events and social gatherings.

Like a few of the other recent PSW presidents, I didn't always know that I wanted to be a pharmacist. And as college graduation time approached, I remember my dad driving all the way down to Madison to take me out for breakfast and figure out what I was planning to do next. Contrary to every piece of advice I have ever given to a student, I had no plan, even though graduation was just weeks away. I ended up taking one of the first

TRANSFORM (VERB)
TRANS-FAWRM

: to make a thorough or dramatic change in the form, appearance, or character

jobs I was offered as a study coordinator at a research lab in Madison. For one of my very first projects, I worked with a pharmacist from a drug company to design a study where we milked rats and evaluated drug concentrations in the milk. First of all, I had no idea you could milk a rat! And—perhaps more importantly—I had no idea that pharmacists could work at a drug company. That interaction opened my eyes to some of the diverse and non-traditional avenues a pharmacy career could take. I worked at the lab for about two years and eventually started pharmacy school back at UW-Madison. Mike Gillard actually hired me for my first ever pharmacy job as a summer intern at Froedtert Hospital in Milwaukee after my second year of pharmacy school. I fell in love with hospital pharmacy—I loved the energy of the hospital, the fast pace we all worked at, and the chance to make a profound impact on patients' lives. After two years of residency at Froedtert and then a few years managing oncology services at the hospital, I took a position at Concordia's School of Pharmacy. At the time, the School of Pharmacy was in its infancy. I was part of the faculty when we were designing the curriculum, writing student learning outcomes for the program, and recruiting sites for our students to do rotations at. As the Director of Experiential Education now for just over 10 years, it has been truly rewarding to work with pharmacists from diverse practice settings all across Wisconsin to make sure that we are training future pharmacists with the knowledge, skills, and attitudes that they need to take care of today's patients.

Again, contrary to any advice I've ever given a student, my sustained involvement with PSW didn't start until after my pharmacy schooling and residency were complete. I gave my first PSW presentation at the Annual Meeting in 2009. Turns out…you should always ask how long they want you to present before you agree to said presentation! That first presentation about new drugs in 2009 had to be 90 minutes long (!), but my time at the meeting really opened my eyes to the Wisconsin pharmacy family—our "pharmily" —that we value so much in our profession in Wisconsin. At that meeting, I met new pharmacists and technicians, and also reconnected with faculty, preceptors, and coworkers that I hadn't seen in some time. From then on, I was hooked.

In my career, I have never known a pharmacy organization in Wisconsin other than the Pharmacy Society of Wisconsin. To me, and to many of you, PSW has always been the one and only pharmacy-focused professional organization in Wisconsin. But it actually wasn't until 1998 that PSW was formed. I know that, to some of you, that seems like a REALLY long time ago! Just over 20 years ago, visionary pharmacy leaders in Wisconsin came together to create PSW, with the mission of providing a unified voice, resources, and leadership to advance the pharmacy profession and improve the quality of medication use in Wisconsin.

In 2020, for only the second time in the organization's existence, the PSW Board of Directors was tasked with hiring a new CEO. And we had big shoes to fill! Chris Decker was instrumental in transforming PSW into the premier state pharmacy organization in the country. We miss him, his warm smile, his words of wisdom, and his love for pharmacy. As an organization, however, we have work to do and we needed a leader who could continue advancing the pharmacy profession with passion and enthusiasm. The PSW Board of Directors formed a search committee, and together these groups spent seven

months working tirelessly to craft a forward-thinking job description, recruit and interview candidates, and ultimately select and hire a new CEO. I am thrilled to have Sarah Sorum as our CEO and Executive Vice President! With her years of experience at PSW, Sarah is perfectly positioned to continue advancing the "One Voice, One Vision" mantra of pharmacy in Wisconsin.

This fall, working closely with Sarah and the PSW staff, the Board of Directors and the Foundation Board will embark on a strategic planning process. We will work together to reaffirm PSW's mission and vision as an organization and make important strategic decisions about the work we will prioritize in the coming years. A pandemic certainly escalates the transformation of an organization, but this strategic planning foundation had already been put in motion by the Board of Directors. Representatives from all different practice settings and projects will be involved in the strategic planning through their engagement with PSW committees, and those conversations are well underway. Additionally, all of you as PSW members are important contributors to this updated strategic plan. Reach out to me, Sarah, or any of the board members to share what is impacting your practice and help us envision the future of pharmacy in Wisconsin.

Pharmacist provider status remains a key strategic initiative for PSW, and 2021 is set to be a big year to transform this work. The Provider Status Core Team has been hard at work for the last two years reviewing other states' provider status efforts and determining the best direction for Wisconsin pharmacy in the future. In Wisconsin, we are fortunate to have a very broad scope of practice already—pharmacists can perform any patient care service delegated to them by a physician. We don't need permission to do the work necessary to take care of our patients. What we are missing are the policy and systems changes to be paid for providing those services. Without payment policy for pharmacist-provided care, innovative practice models and services can't grow or expand. Wisconsin's plan for pharmacist provider status is focused on ensuring that patients have sustainable access to pharmacist-provided care by adding pharmacists to the list of covered Medicaid providers. It's not just important to have adequate reimbursement for a pharmacy, but it's also important to have reimbursement policy for pharmacists. It's not enough to just pay buildings or departments; we need to pay pharmacists as healthcare providers. The addition of pharmacists as covered providers would allow pharmacists to bill and receive payment for patient care services under the medical benefit. Billable patient care services could include immunizations, medication injections, point of care testing, chronic disease state management under a collaborative practice agreement, or maybe even COVID-19 testing. I also think it's important to highlight that the implementation of pharmacist provider status is not going to be identical across Wisconsin. There's not one "right" way to use pharmacist provider status. But it's imperative for our profession and for the patients that we take care of that pharmacists attain this recognition as part of the healthcare team. PSW is committed to continued advocacy at the state level and working with our national partners on federal movement of this issue.

The road to provider status in Wisconsin is not an easy path. Many other states have spent years (or even decades!) moving these initiatives forward. The Provider Status Core Team has done remarkable work so far to ensure that our message, as pharmacy professionals in Wisconsin, is clear, consistent, and understandable. I want to give a special thanks to the members of the core team for their dedication to this important initiative: Julie Bartell, Adam Gregg, Nick Olson, Ellina Seckel, Jordan Spillane, and Dimmy Sokhal, and PSW staff members Megan Grant, Erica Martin, Kari Trapskin, and Danielle Womack. That is a powerhouse leadership team! Now, we need all pharmacists, technicians, and students on board to message these four key points:

1. Pharmacists should be equitably paid for providing services, within their scope, that would be traditionally reimbursed for other healthcare providers.
2. As medication costs continue to rise, pharmacists are best positioned to ensure optimal medication-related outcomes.
3. Pharmacists must be recognized as part of the integrated healthcare team.
4. Provider status will help advance the profession of pharmacy to improve patients' access to care in the state of Wisconsin.

The next few months will be important in transforming these messages into action. PSW is working with legislators to draft pharmacist provider status legislation and we plan to support the introduction of it when the next legislative session begins in January. We need the help of all of our members to continue sharing these messages within and outside of our profession. PSW has engaged healthcare provider groups, Medicaid, and others to ensure they understand and support our efforts. Pharmacist provider status needs to be front of mind and a point of discussion as you interact with your peers, your colleagues, and your pharmacy learners in the coming months.

Pharmacist provider status isn't the only transformative work that PSW is doing. Immunization projects continue to be an important part of the public health initiatives that PSW is engaged in. Last year, PSW supported legislation allowing pharmacists to administer any vaccine listed in the current ACIP schedule, without a vaccine protocol or prescription order. This legislation also included provisions for immunizing very young children with prescription orders and reporting to the Wisconsin Immunization Registry. This legislation was signed by the governor last fall and gives patients expanded access to immunizations. PSW's immunization work also includes significant contributions to the interprofessional Immunization Summit and publications in peer-reviewed journals.

As you may recall from Legislative Day in February, PSW has also been advocating for legislation to reform pharmacy benefit managers (PBMs) in order to lower medication costs for patients, increase their access to pharmacist-provided care, and improve transparency and accountability of PBM practices. After months of hearings and meetings and amendments, the PBM bill passed the Wisconsin Assembly.

Above: *Presentation slide including images of Melissa and her family from Melissa Theesfeld's Presidential address during the 2020 Virtual PSW Annual Meeting.*

moment when everything can change all at once. That description actually feels like where we, as members of PSW, are at right now. Gladwell says, "The world of the Tipping Point is a place where the unexpected becomes expected, where radical change is more than possibility. It is—contrary to all our expectations—a certainty." Right now, we are at a Tipping Point. Change surrounds us every day. It surrounds our patients every day. And we know– with certainty—that it is going to continue. As PSW members, we are important drivers of the tipping point. Small changes that we make, and small changes that we encourage our patients to make, can transform lives. Big changes can quickly follow from seemingly small events, and all of us have experienced that in the last few months. But what if this tipping point ultimately makes us better pharmacists and technicians? What if we are now so accustomed to change that it becomes less scary? Maybe this is the just the right time for us to embrace the change that we want to see in Wisconsin pharmacy.

PSW members are perfect "connectors"—individuals, Gladwell describes, who know lots of people and have a gift for bringing them together. We

I want to take a few minutes to talk specifically to the students who are watching this address today. Working with pharmacy students is truly my passion and I am privileged to work with them every day. The next few months and years will most certainly look different than what you envisioned when you first thought about attending pharmacy school. Your classrooms, your exams, study groups, social activities, post-grad opportunities, and your jobs have all been significantly transformed. And this change is not easy. But as a profession, we need you. We need your ideas, we need your energy, and we need your enthusiasm. You, too, are important connectors and are vital in the transformation we want to see in Wisconsin pharmacy. You aren't "just" students in pharmacy school. You are the individuals who have new solutions and who can see new ways to do what we've always done. You can speak up when you have an idea and you can embrace new pharmacist and technician roles. Whether in person or virtually, you are going to have amazing learning opportunities during pharmacy school. All of the classes you take, the lab work, and your rotations are opportunities to work with and learn from about working successfully as a team and managing a team. I was fortunate to be hired at Concordia very early in the School of Pharmacy's development. Without any formal teaching skills or knowledge of the world of academia, Curt Gielow, Dean Arneson, and Mike Brown hired me. They allowed me to be creative (well—as creative as pharmacists get!) in designing rotations for students, recruiting preceptors, and getting rotations integrated into the rest of the curriculum. My experiential team—Sarah Peppard, Robby Mueller, Emily Bryant, and El Mueller—is top notch and effortlessly cover for me when I'm not able to be on campus. I sincerely appreciate your friendship and your dedication to the work that we do. All of the faculty and staff at Concordia demonstrate a true passion and caring for our students—students who are the next generation of pharmacists that will continue transforming our profession both within and outside Wisconsin.

For the last year, I was fortunate to work with an incredible executive committee. Matt Mabie, Mike Gillard, Ryan Miller and I have known each other for several years with our involvement on the PSW board of directors. We spent most of our time together on Zoom in

recent months, but were able to have some fun along the way, too! These guys aren't afraid to ask tough questions, consider all opinions and options, and make decisions that keep PSW a premier state pharmacy organization. I want to also send a special thank you to Sarah Sorum and the entire PSW staff. This has been a truly remarkable year for all of them, too. They work tirelessly to serve our members, coordinate large-scale projects, and advocate for the profession of pharmacy in Wisconsin. They are always available to answer questions and haven't shied away from any of the challenges they faced this year. Thanks for always having such a positive attitude and huge smiles to share with us!

And last, but certainly not least, I need to thank my family and friends. My parents, Dawn and Fred Martin, are probably watching this from sunny South Carolina today. They are role models for working hard to accomplish your goals. They are also examples of creating and maintaining strong relationships with your family and friends. My husband Shawn (another Badger Band alum!) and my kids Grant and Kate are also watching today and I want to thank them for their love and support. Shawn has been with me through pharmacy school, residencies, and several job changes. He keeps me grounded, makes sure that we take time to laugh, and fills every day with moments of happiness for our family. I don't think that the kids are quite old enough to truly understand what a pharmacist does. But I hope they see that if you're passionate about what you do, your work can also be filled with fun and friendships. And thank you too to my extended family—Jason and Bridget, Chuck and Donna, and Erica and Andy—for your unwavering support and guidance.

Whether we pivot to make a quick change, or we transform our profession to meet the needs of our patients safely, all of us must be nimble. In the months and years to come, we will continue to learn and experience the lasting effects of COVID-19 on our patients, our businesses, and our profession. As I close today, I want to reiterate the simple, yet profound, vision of PSW: Together we can inspire each other to advance our profession to enhance the lives of our patients. I am excited to work with all of you in the coming year and to keep our patients at the center of our work. We are the connectors who will transform the future of pharmacy! Thank you!

Melissa Theesfeld is the President of the Pharmacy Society of Wisconsin in Madison, WI.

2020 PSW Award Recipients

These awards were presented during the Virtual PSW Annual Meeting on August 27 from 6:30 pm - 8:00 pm.

PHARMACIST OF THE YEAR
Adam Gregg, PharmD, BCPS
Gundersen Health System
La Crosse

DISTINGUISHED SERVICE AWARD
Lynnae Mahaney, MBA, BS Pharm, FASHP
American Society of Health-System Pharmacists
Madison

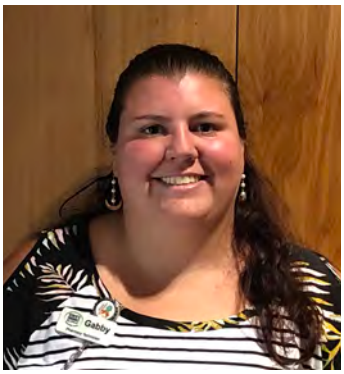
PSW INTERDISCIPLINARY CARE PARTNER AWARD
Thomas Carver, MD FACS
Medical College of Wisconsin
Milwaukee

CURTIS A. JOHNSON AWARD
Lynne Fehrenbacher, PharmD, BCPS-AQ ID
William S. Middleton Memorial Veterans Hospital
Madison

EXCELLENCE IN INNOVATION
Theresa Frey, PharmD, BCCP
William S. Middleton Memorial Veterans Hospital
Madison

YOUNG PHARMACIST OF THE YEAR
Noah Franz, PharmD, MHA
Froedtert and Medical College of Wisconsin
Milwaukee

BOWL OF HYGEIA
Ronald Mabie, RPh
Retired Pharmacist
Madison



TECHNICIAN OF THE YEAR
Gabby Gaura, CPhT
Streu's Pharmacy
Green Bay

WISCONSIN PHARMACY QUALITYCOLLABORATIVE
an initiative of the pharmacy society of wisconsin

Congratulations to Wisconsin Pharmacy Quality Collaborative (WPQC) 2020 Awardees!

The Pharmacy Society of Wisconsin (PSW) congratulates the 2020 Wisconsin Pharmacy Quality Collaborative (WPQC) Awardees on their exceptional service provided during the last year. Typically awarded during the Annual Meeting in person, this year the awardees were recognized during the awards ceremony at the virtual Annual Meeting the evening of August 27, 2020. Four awards were provided by PSW this year: two WPQC Engagement Awards and two WPQC Innovation Awards. The WPQC Engagement Award honors pharmacists and practices who have been engaged in multiple facets of WPQC and have been high utilizers of the program. The Innovation Award honors pharmacists and practices who have been engaged in WPQC while also demonstrating a passion for innovation. PSW thanks all of the awardees for their continued support of Wisconsin patients and the WPQC program.

WPQC Engagement

Boscobel Pharmacy

Boscobel Pharmacy, led by Michelle Farrell, PharmD, BCACP, has been involved in the WPQC program since 2008. They have put workflow modifications in place since the beginning, have consistently been amongst the top providers of CMR/A services for Medicaid members, and engage their whole team at Boscobel Pharmacy in service provision. Not only are they a member of WPQC, but they are also a member and Michelle is the lead luminary for the Wisconsin chapter of the Community Pharmacy Enhanced Services Network and leads the Flip the Pharmacy initiative with PSW.

Michelle said, "Our rural patient population has benefited greatly from the many resources afforded us by the WPQC program. We are so fortunate to have had the opportunity to utilize training and peer support to expand our clinical services and enhance the care we provide our patient population."

Below: *Boscobel Pharmacy Staff.*

Above: *Moath Sarsour from Long Life Pharmacy.*

Long Life Pharmacy

Long Life Pharmacy is owned and operated by Moath Sarsour, and just became WPQC-accredited in early 2020 when he opened his own pharmacy in Milwaukee. In the following 6 months, the pharmacy has became one of the high performers in terms of providing CMR/A services to Medicaid patients.

Moath said, "Long Life Pharmacy realized that a majority of our customers have low health literacy and we wanted to find a way to resolve this issue. WPQC has been instrumental in helping our customers improve to their adherence to their medications as well as increasing their overall knowledge about their medications. By applying the practices of WPQC regularly, our customers at Long Life Pharmacy have improved the quality of their health and are proactive in their healthcare. Because they have a better knowledge of their health status, our customers have taken a major role in the outcome of their health."

Reedsburg Area Medical Center - Viking Pharmacy

Viking Pharmacy is located in Viking Foods in Reedsburg and this spectacular team has risen to the occasion to participate in two cardiovascular disease pilots coordinated by PSW with WEA Trust. They have been a super utilizer during the pilots and contributed to data that will be published this year by Centers for Disease Control and Prevention.

According to Tiaha McGettigan, "RAMC Viking Pharmacy has been fortunate to work with WPQC and WEA over the past few years. This partnership created opportunities for pharmacists to help people living right in our community. Not only were we able to equip people with the tools and knowledge necessary to monitor their own conditions at home, but we were able to empower individuals to take control of their own health. Our work together has facilitated pharmacy innovation while still allowing pharmacists to build strong relationships with patients."

Monica Cauble - Community Pharmacy, Madison

Monica works at Community Pharmacy in Madison and has been a generous contributor to the success of the Community CMR/A program in Dane County. She has been selfless with her time and enthusiastic about providing services no matter the venue. She also provides services to Medicaid members.

Monica shared, "I became WPQC certified in 2014 after moving to Wisconsin from Texas and starting work at Community Pharmacy in Madison. I was impressed by the organization and scope of the WPQC program since it allowed me to continue MTM work that I had previously been doing in Texas. I started by providing CMRs at Community Pharmacy then got involved volunteering with the United Way funded CMR program. I have provided CMR services at senior centers, libraries, and even travelled to a patient's home through the United Way funded CMR program. I enjoy the opportunity to sit down with patients, answer questions, and provide education in a private setting.

Above: *Monica Cauble from Community Pharmacy in Madison.*

Each CMR is so different and unique and patients are often so grateful to get the one-on-one time to speak with a pharmacist."

Kari Trapskin is the Vice President of Health Care Quality Initiatives at the Pharmacy Society of Wisconsin in Madison, WI.

Below: *Reedsburg Area Medical Center - Viking Pharmacy Staff.*

Apply Now!

2021 COMMUNITY PHARMACY SCHOLARSHIP

APPLY OCTOBER 1 - DECEMBER 1, 2020

Recipients selected will each be awarded $2,500. Up to $50,000 in scholarships are awarded annually.

TO BE ELIGIBLE TO APPLY for the 2021-2022 Pharmacists Mutual Community Pharmacy Scholarship, students must meet the following criteria:

- Be a current P2 or P3 pharmacy student that will be a P3 or P4 pharmacy student in the 2021-2022 academic year
- Eligible students must plan to practice in one of the following settings:
  - an independent or small chain community pharmacy
  - an underserved geographic or cultural community, preferably in an independent or small chain community pharmacy

pharmacists mutual™

TOMORROW. IMAGINE THAT.

Pharmacists Mutual Insurance Company
808 Highway 18 W | PO Box 370
Algona, Iowa 50511
P. 800.247.5930 | F. 515.295.9306
info@phmic.com

phmic.com

FOR ELIGIBILITY REQUIREMENTS AND TO APPLY:

phmic.com/scholarship