Currents in Pharmacy Teaching and Learning 17 (2025) 102429

Contents lists available at ScienceDirect

Currents in Pharmacy Teaching and Learning

journal homepage: www.sciencedirect.com/journal/currents-in-pharmacy-teaching-and-learning

Pharmacological considerations for healthcare providers when caring for Muslim patients: A practical guide☆

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ARTICLE INFO

Keywords:
Muslim patients
Cultural competence
Medication formulation
Alcohol in pharmaceuticals
Gelatin in pharmaceuticals
Religious considerations
Islamic bioethics
Patient-centered care
Pharmaceutical alternatives
Medication adherence

ABSTRACT

Healthcare providers increasingly encounter Muslim patients with unique pharmacological considerations influenced by religious beliefs and practices. Islam, as the world's second-largest religion, includes specific guidelines affecting medication permissibility, particularly regarding alcohol and pork-derived ingredients. This educational guide examines the intersection of Islamic teachings with pharmacotherapy, providing examples of commonly prescribed medications containing alcohol or porcine-derived gelatin from our academic medical center's inpatient and outpatient formulary. We document alcohol content percentages in various medications and suggest possible alternatives as illustrative examples. Most importantly, we present a step-by-step practical framework for using National Drug Code (NDC) numbers and the DailyMed database, enabling healthcare professionals at any institution to determine medication suitability for their Muslim patients. Our guide demonstrates that while numerous medications contain ingredients that may conflict with Islamic guidelines, alternatives often exist and can be systematically identified. We advocate for a collaborative, culturally-sensitive approach to medication prescribing that involves shared decision-making, respects religious beliefs, and incorporates alternative formulations when available. By implementing the practical strategies outlined in this educational guide, healthcare providers can enhance medication adherence, strengthen patient-provider relationships, and deliver more culturally competent care to Muslim patients.

Background and significance

As clinicians working in Philadelphia's diverse healthcare environment, we've witnessed firsthand the challenges that arise when standard medication formulations conflict with patients' religious beliefs.[1] At Jefferson Einstein Hospital (JEH) and Jefferson Einstein Montgomery Hospital (JEMH), we frequently encounter Muslim patients whose care requires special consideration of medication ingredients.[2,3] These weren't abstract concerns from textbooks—we observed real instances where patients refused medications or stopped taking prescribed therapies after discovering they contained forbidden ingredients.

The Muslim community represents a varied demographic across our service areas, with approximately 11.7 % of JEH emergency department patients and 2.5 % of JEMH patients identifying as Muslim.[4] These numbers aren't just statistics to us—they represent

☆ This article is part of a Special issue entitled: 'Multicultural Pharmacy Education' published in Currents in Pharmacy Teaching and Learning.

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https://doi.org/10.1016/j.cptl.2025.102429
Received 20 April 2025; Received in revised form 29 May 2025; Accepted 18 June 2025
Available online 4 July 2025

thousands of individuals each year whose healthcare needs intersect with deeply-held religious beliefs. Throughout our clinical practice, we've seen how religious dietary restrictions extend beyond food to medication ingredients, creating tangible barriers to adherence and optimal therapeutic outcomes.[5,6]

Our interest in this topic began in earnest when we encountered a Muslim patient who refused his liquid medication in the emergency department after learning it contained alcohol.[7] A clinical pharmacist was consulted but struggled to quickly identify a suitable alternative, leading to treatment delays. This prompted us to investigate the level of awareness among our own staff. When we surveyed Emergency Medicine Residents at our institutions in 2023, only 41 % of respondents at JEH and 36 % at JEMH could correctly identify medications containing ingredients prohibited in Islam.[8] One resident physician remarked, "I prescribe liquid medications all the time without ever considering their alcohol content."

Padela and Curlin[9] and Attum et al[10] have written about broader cultural considerations in Muslim healthcare, but our literature review revealed a notable gap in practical guidance for pharmacists and physicians. While we found numerous papers discussing Ramadan fasting considerations[11] or general cultural competence, practical tools for identifying problematic medication ingredients were conspicuously absent. As one of our pharmacists noted, "I know Muslims avoid pork and alcohol, but I have no systematic way to check if medications contain these ingredients."

This educational guide emerged directly from our clinical experiences and the practical challenges we faced caring for Muslim patients. We've developed and tested these approaches in our emergency departments and inpatient units, refining them based on feedback from both healthcare providers and patients. By sharing these practical tools, we hope to help other institutions avoid the awkward moments and treatment delays we initially encountered, ultimately enhancing medication adherence through culturally sensitive prescribing practices.

Educational framework and resources

Approach to medication review

Our educational framework is based on a comprehensive review of medication formulations commonly used at Jefferson Health's Philadelphia and Montgomery County facilities. Jefferson Einstein Hospital (JEH) is a 499-bed tertiary care academic medical center in North Philadelphia, while Jefferson Einstein Montgomery Hospital (JEMH) is a 191-bed community hospital in Montgomery County, both formerly part of Einstein Healthcare Network before joining Jefferson Health. Collectively, these facilities serve approximately 105,000 emergency department visits annually, with Muslim patients comprising 11.7 % of the patient population at JEH and 2.5 % at JEMH according to registration data.

Table 1
Examples of commonly prescribed oral suspensions with information on alcohol content and potential alternatives.

Drug name (oral suspension)	Alcohol present?	Alcohol percentage	NDC reference	Possible alternative
Digoxin 0.05 mg/1 mL	Yes	10 %	69,292–605-60	Tablet formulation
Trimethoprim/Sulfamethoxazole 40 mg/200 mg in 5 mL	Yes	0.04 %	65,862–496-47	Tablet formulation
Chlorhexidine 0.12 %	Yes	11.6 %	0121–0893-15	Alcohol-free mouth rinse
Sodium Polystyrene Sulfonate 15 g/60 mL	Yes	0.3 % (*v*/v)	46,287–006-60	Patiromer
Nystatin 500,000 units/5 mL	Yes	$\leq$ 1 %	63,739–160-70	Clotrimazole troches
Fluphenazine	Yes	14 %	0703–2502-01	Tablet formulation
Promethazine	Yes	7 %	0121–0778-16	Tablet formulation
Donnatal	Yes	23.8 %	0037–0301-67	Individual component tablets
Prednisone	Yes	5 %	0121–0795-15	Tablet formulation
Prednisolone	Yes	5 %	0121–0799-15	Tablet formulation
Griseofulvin	Yes	0.2 %	0115–1772-46	Tablet formulation
Gabapentin	Yes	8.2 %	0121–1463-16	Tablet/capsule formulation
Acetaminophen 160 mg/5 mL	No	–	68,094–231-59	Not needed (alcohol-free)
Acetaminophen 160 mg/5 mL (Children's Tylenol)	No	–	50,580–579-02	Not needed (alcohol-free)
Phytonadione 10 mg/mL (2.5 mg/2.5 mL)	No	–	00409–9158-01	Not needed (alcohol-free)
Ferrous Sulfate 300 mg/5 mL	No	–	0121–0530-05	Not needed (alcohol-free)
Furosemide 40 mg/5 mL	No	–	68,094–867-59	Not needed (alcohol-free)
Calcium Carbonate 1250 mg/5 mL	No	–	0121–4766-05	Not needed (alcohol-free)
Guaifenesin & Dextromethorphan 200 mg/20 mg per 10 mL	No	–	69,339–150-01	Not needed (alcohol-free)
Levetiracetam 500 mg/5 mL	No	–	61,953–020-16	Not needed (alcohol-free)
Lactulose 20 g/30 mL	No	–	0121–1154-30	Not needed (alcohol-free)
Phenytoin 100 mg/4 mL	No	–	66,689–036-01	Not needed (alcohol-free)
Loperamide 2 mg/15 mL	No	–	68,094–129-59	Not needed (alcohol-free)
Megestrol 400 mg/40 mL	No	–	66,689–020-01	Not needed (alcohol-free)
Milk of Magnesia 400 mg/5 mL	No	–	0121–0421-30	Not needed (alcohol-free)
Metoclopramide 10 mg/10 mL	No	–	66,689–031-01	Not needed (alcohol-free)
Oxcarbazepine 300 mg/5 mL	No	–	65,162–649-78	Not needed (alcohol-free)
Senna Syrup 8.8 mg/5 mL	No	–	48,433–219-05	Not needed (alcohol-free)
Sucralfate 1 g/10 mL	No	–	68,094–043-59	Not needed (alcohol-free)
Sodium citrate and citric acid 1.5 g/1 g in 15 mL	No	–	0121–0595-15	Not needed (alcohol-free)
Valproic Acid 250 mg/5 mL	No	–	0121–4675-05	Not needed (alcohol-free)

Our approach consisted of three primary components: (1) compilation of example medications from our formulary, (2) analysis of religious guidelines regarding medication permissibility, and (3) development of a practical tool for healthcare providers to use at their own institutions.

To identify example medications, we conducted a systematic review of the formularies at both JEH and JEMH using the FDA's National Drug Code (NDC) Directory and DailyMed database from January to June 2024. Our search strategy involved:

1. Extracting the top 200 most frequently prescribed medications at each institution from our electronic health record system.
2. Searching each medication's NDC in the DailyMed database using both proprietary and non-proprietary names.
3. Reviewing the inactive ingredients section of each medication's label information.
4. Documenting the presence and concentration of alcohol or porcine-derived gelatin.

We verified all NDC reference numbers in Table 1 through direct comparison with manufacturer package labels and the FDA's official NDC Directory (accessed July 2024). This thorough verification process was essential as we discovered several instances where NDC numbers had changed due to manufacturer updates or reformulations.

Selection criteria for example medications

We selected medications for inclusion in our examples if they: (1) contained alcohol (ethanol) or gelatin as inactive ingredients, (2) had complete formulation information available through official sources, and (3) were commonly prescribed in our clinical practice. We excluded medications that were: (1) discontinued or not currently marketed in the United States, (2) had incomplete formulation information, or (3) were used exclusively in specialized settings unlikely to be encountered in general practice.

Information documentation

For each identified example medication, we documented the following data: generic name, brand name (if applicable), dosage form, strength, NDC number, alcohol percentage (if present), presence of gelatin (yes/no), source of gelatin (if specified), and availability of alternative formulations. The alcohol percentage was documented as reported in official product labeling or manufacturer information.

Islamic perspective on medication ingredients

To provide context for healthcare providers, we reviewed scholarly interpretations of Islamic texts regarding medication permissibility from major Islamic jurisprudence schools (Hanafi, Maliki, Shafi'i, and Hanbali). This included analysis of published fatwas (religious rulings) from recognized Islamic authorities and scholarly articles addressing pharmaceutical ingredients from an Islamic perspective. [12,13] The principle of necessity (darura) and its application to medical treatments was specifically examined to help providers understand when exceptions might apply.

Development of practical tools

Based on our experience with medication review at our institution, we developed a practical step-by-step guide for healthcare providers to identify and address potential religious conflicts with medication formulations at their own institutions. This framework was designed to be integrated into clinical workflows with minimal disruption while maximizing cultural sensitivity.

Guide to common medications and alternatives

Medications containing alcohol

Our institutional review identified that 14.2 % (37/260) of liquid oral medications in the JEH formulary and 12.8 % (29/226) in the JEMH formulary contain alcohol as an inactive ingredient. Table 1 presents a list of oral suspensions frequently encountered in our hospital setting, including their alcohol content percentages where applicable.

Among intravenous medications, 9.6 % (12/125) at JEH and 8.9 % (10/112) at JEMH contained traces of alcohol as a solubilizing agent. Approximately 18.7 % (72/385) of capsule formulations in our JEH formulary and 16.9 % (58/343) in our JEMH formulary contained gelatin, with approximately 65 % of these specifically identified as porcine-derived based on manufacturer information.

Many liquid medication formulations contain alcohol for stability purposes, solubility enhancement, or as a preservative.[14] The alcohol content ranges significantly from trace amounts (0.04 % in Trimethoprim/Sulfamethoxazole) to substantial percentages (23.8 % in Donnatal). For most medications listed, alternative formulations without alcohol are available, typically as tablets or capsules.

Medications containing gelatin

Gelatin derived from porcine sources is commonly used in capsule shells and as a coating or binding agent in various pharmaceutical formulations.[3] Table 2 presents examples of commonly prescribed medications containing gelatin and their alternatives that

we identified at our institution.

Our analysis revealed that most gelatin-containing medications have alternative formulations available. However, certain specialized drug delivery systems, particularly enteric-coated or extended-release formulations, may not have readily available alternatives without gelatin.

Practical tool: How to identify medication ingredients

Based on our experience, we developed a systematic approach for healthcare providers to identify alcohol or gelatin in any medication, not just those in our institutional formulary.[3] This practical tool can be applied at any healthcare institution and is illustrated below:

Step 1: Locate the National Drug Code (NDC)

The NDC is a unique three-part identifier assigned to every human drug approved by the FDA. For over-the-counter products, the NDC can typically be found:

- On the front of the product packaging (usually in small print)
- Within the barcode number (immediately following the first digit "3")

For prescription medications:

- On the manufacturer's stock bottle
- In electronic health record systems
- In pharmacy databases

Step 2: Utilize DailyMed to identify inactive ingredients

The National Library of Medicine hosts DailyMed (dailymed.nlm.nih.gov), a comprehensive database of medication information:

1. Navigate to the DailyMed website
2. Enter the NDC number or medication name in the search bar
3. Select the specific product from search results
4. Navigate to the "Inactive Ingredients" section
5. Review the complete list of inactive ingredients

Step 3: Evaluate religious permissibility and identify alternatives

After identifying potentially problematic ingredients:

1. Determine if the ingredient is alcohol, gelatin, or another prohibited substance
2. Assess the concentration or amount present
3. Search for alternative formulations using the same database
4. Consider therapeutic alternatives in the same drug class if necessary

Understanding Islamic perspectives on medication use

Our review of Islamic scholarly opinions regarding medication permissibility revealed several key principles that healthcare providers should understand when discussing options with Muslim patients:[1,7]

Table 2
Examples of common medications containing gelatin and potential alternatives.

Medication	Dosage form	Contains gelatin	Source of gelatin	Alternative formulation
Advil® Gel Caplets	Capsule	Yes	Porcine	Advil® tablets
Tylenol® Extra Strength Rapid Release	Capsule	Yes	Porcine	Tylenol® tablets
Omeprazole (many brands)	Delayed-release capsule	Yes	Porcine	Tablet formulation
Warfarin (many brands)	Capsule	Yes	Porcine	Tablet formulation
Fish Oil supplements	Soft gel	Yes	Porcine/Bovine	Liquid formulation
Vitamin D supplements	Soft gel	Yes	Porcine/Bovine	Tablet or liquid formulation
Vitamin E supplements	Soft gel	Yes	Porcine/Bovine	Tablet formulation

Necessity principle (Darura)

Most Islamic scholars agree that prohibited substances may be permissible in medications when:

- No halal alternative exists
- The medication is needed to preserve life or prevent serious harm
- The amount used is the minimum necessary[15,16]

Transformation principle (Istihalah)

Some scholars argue that when alcohol or other prohibited substances undergo chemical transformation during manufacturing, the resulting medication may be permissible.[17]

Alcohol content considerations

There is consensus among most scholars that:

- External use of alcohol (topical applications) is generally permitted
- Trace amounts of alcohol used as preservatives or solvents may be acceptable when alternatives are unavailable
- Higher concentrations of alcohol without medical necessity remain prohibited[18,19]

Gelatin considerations

Scholarly opinions regarding gelatin vary:

- Some scholars permit the use of porcine-derived gelatin in medications based on the necessity principle
- Others require bovine or fish-derived gelatin alternatives when available
- Most agree that tablet formulations are preferable to gelatin capsules when therapeutically equivalent[20]

Implementation and clinical considerations

Application in clinical practice

The tools and examples provided in this guide have several important implications for healthcare providers. First, the prevalence of alcohol and gelatin in commonly prescribed medications highlights the need for increased awareness among healthcare professionals.[2,8] The identification of these ingredients is not straightforward, as they are often not prominently displayed on medication labels or in prescribing information. The practical framework we have developed provides a systematic approach for identifying these ingredients in clinical practice at any institution.

Second, our examples demonstrate that suitable alternatives exist for many medications containing prohibited ingredients. However, these alternatives may differ in terms of effectiveness, side effect profile, cost, or convenience.[21] Healthcare providers should carefully consider these factors when recommending alternatives, engaging in shared decision-making with patients to balance religious considerations with therapeutic needs.[5,6]

Third, our overview of Islamic scholarly opinions reveals that while prohibitions exist, there is flexibility within Islamic jurisprudence for necessary medical treatments. Understanding these nuances can help healthcare providers navigate conversations with Muslim patients about medication options, acknowledging religious concerns while providing evidence-based care.[22]

Challenges and solutions

Despite the availability of alternatives, several challenges exist in providing culturally appropriate pharmacological care to Muslim patients. Electronic health record systems rarely flag medications containing alcohol or porcine-derived ingredients, requiring manual checking by healthcare providers or pharmacists.[23] Additionally, medication shortages may limit the availability of alternative formulations, particularly in inpatient settings or emergency situations.[24]

Educational barriers also exist, with many healthcare providers receiving limited training in cultural competence related to medication prescribing.[25] Our review of healthcare literature revealed few comprehensive resources addressing Islamic pharmacological considerations, highlighting the need for enhanced education and training in this area.

Practical applications for healthcare settings

Tool implementation at our institution

Our practical framework for identifying halal medication alternatives has been piloted at two facilities within our health system:

Jefferson Einstein Hospital (JEH), a 499-bed tertiary care academic medical center serving North Philadelphia's diverse community, and Jefferson Einstein Montgomery Hospital (JEMH), a 191-bed community hospital located in Montgomery County. Based on our emergency department registration data, approximately 11.7 % of patients at JEH and 2.5 % of patients at JEMH identify as Muslim demonstrating the varied demographic composition across our health system and the importance of culturally sensitive practices across different care settings.

The implementation process focused on emergency medicine and involved two key components:

1. Educational sessions for prescribers: We conducted targeted educational sessions for emergency medicine residents and attending physicians at both facilities. These sessions introduced our framework, demonstrated the DailyMed search process, and provided case-based scenarios for identifying medication ingredients that may conflict with Islamic guidelines. A total of 28 emergency medicine physicians participated in these initial educational sessions.
2. Innovative electronic health record integration: Working with our pharmacy department, we implemented a novel approach using the existing allergy alert system. For Muslim patients with dietary restrictions, we add "pork" as an allergy in the electronic health record. This triggers an automatic alert whenever a medication containing porcine-derived gelatin is prescribed. This creative solution leverages existing EHR functionality to support culturally appropriate prescribing without requiring complex system modifications.

This approach has several advantages:

- It integrates seamlessly into existing clinical workflows
- It places minimal additional burden on busy emergency physicians
- It creates a system-level safeguard that follows the patient throughout their hospital stay
- It facilitates interprofessional collaboration between physicians and pharmacists

Implementation challenges included:

- Initial physician resistance to adding non-traditional "allergies" to the medical record
- The need to distinguish between true allergic reactions and religious restrictions
- Ensuring appropriate documentation in the allergy section
- Limited ability to flag alcohol-containing medications through the allergy system
- Variable awareness of the initiative among rotating residents and locum physicians

This pilot initiative in our emergency departments has generated interest from other specialties within our institutions, with plans to expand the educational sessions and "pork allergy" alert system to inpatient medicine, pediatrics, and surgery departments in the coming year.

Recommendations for other healthcare systems

Based on our experience, we recommend several system-level approaches to enhance culturally appropriate care for Muslim patients:

1. **Electronic Health Record Integration**: Develop and implement alerts or flags within electronic prescribing systems to identify medications containing alcohol or porcine-derived ingredients.[23,26] Our "pork allergy" approach offers a simple implementation method using existing EHR functionality.
2. **Pharmacy Protocols**: Establish pharmacy protocols for identifying and suggesting alternatives to medications containing prohibited ingredients, particularly in hospitals with significant Muslim patient populations.[27]
3. **Educational Initiatives**: Incorporate cultural competence training specifically addressing medication considerations for Muslim patients into healthcare professional education and continuing education programs.[25,28]
4. **Formulary Management**: Consider religious permissibility alongside traditional formulary criteria (efficacy, safety, cost) when selecting medications for hospital formularies or preferred medication lists.
5. **Patient Education Materials**: Develop culturally appropriate patient education materials explaining medication ingredients and potential alternatives in multiple languages common among Muslim populations.

Considerations when using this guide

Several considerations should be acknowledged when applying this guide in practice. First, our examples focus primarily on medications commonly used in our institution in the United States, and availability of alternatives may differ in other healthcare settings and countries. Second, while we attempted to include diverse examples, the constantly changing pharmaceutical market means that new formulations may have become available since our compilation.

Additionally, our summary of religious guidelines represents predominant scholarly opinions but cannot capture the full diversity of interpretations within Islamic jurisprudence. Individual patients may follow different scholarly opinions or have personal

interpretations that differ from those presented. Finally, medication information may change as manufacturers alter formulations, requiring ongoing updates to this type of guidance for healthcare providers.[21,24]

Summary and best practices

This educational guide highlights the importance of considering religious and cultural factors when prescribing medications to Muslim patients. Many commonly prescribed medications contain alcohol or porcine-derived gelatin, which may conflict with Islamic dietary restrictions.[1–3] However, alternatives are often available, and a systematic approach to identifying problematic ingredients can help healthcare providers offer culturally appropriate care.

We advocate for a collaborative approach to medication prescribing, involving shared decision-making with Muslim patients.[5,6] This approach should be characterized by cultural humility, respect, and a non-judgmental attitude. Healthcare providers should strive to offer alternatives whenever possible, acknowledging and accommodating the religious beliefs and preferences of Muslim patients.

By adopting a culturally sensitive and patient-centered approach to medication prescribing, healthcare providers can ensure that Muslim patients receive the care they need while respecting their religious beliefs and practices. This approach not only promotes trust and rapport between providers and patients but also contributes to improved healthcare outcomes for all individuals, irrespective of their cultural or religious background.

Future efforts should focus on developing and evaluating interventions to improve healthcare providers' knowledge of and attitudes toward cultural considerations in pharmacological care. Additionally, collaborative efforts between pharmaceutical manufacturers, regulatory agencies, and religious scholars could lead to clearer labeling of medication ingredients and increased availability of culturally appropriate alternatives.

Informed consent statement

Not applicable.

Institutional review board statement

Not applicable.

Funding

This educational guide received no external funding.

CRediT authorship contribution statement

Layla Abubshait: Conceptualization, Methodology, Investigation, Writing – original draft, Supervision, Project administration. **Nissa Tasnim:** Conceptualization, Formal analysis, Data curation, Writing – review & editing. **Taha Cangoz:** Investigation, Resources, Writing – review & editing.

Declaration of competing interest

The authors declare no conflict of interest.

Data availability

All data presented in this study are included in the article.

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