

# Pharmaceutical Waste Disposal Awareness Among Pharmacists: A Cross-Sectional Analysis

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## ABOUT THE STUDY

Pharmaceutical waste disposal has emerged as a significant public health and environmental issue due to the increasing consumption of medications and inadequate systems for the proper discarding of expired, unused, or leftover drugs. The improper disposal of pharmaceuticals such as flushing them down toilets or discarding them in general household waste has been linked to contamination of water bodies, soil pollution, and the emergence of drug-resistant microorganisms. Pharmacists, being the final point of contact in the medicine distribution chain and key custodians of public drug information, play a critical role in ensuring safe pharmaceutical disposal. This cross-sectional study was conducted among practicing pharmacists across public and private sectors in Austria to assess their knowledge, attitudes, and practices regarding pharmaceutical waste disposal, with the aim of identifying gaps and proposing targeted interventions.

The study recruited 412 pharmacists from urban and rural regions through a structured online and paper-based questionnaire distributed over a 3-month period. The questionnaire comprised four sections: demographics, knowledge assessment, current disposal practices, and perceptions regarding institutional support and regulatory awareness. The participant pool included pharmacists from hospital pharmacies, community pharmacies, and academic institutions, providing a comprehensive representation of Austria's pharmaceutical workforce.

Findings revealed that while a high percentage of pharmacists (87%) recognized the environmental risks associated with improper pharmaceutical disposal, only 58% reported following standardized protocols consistently in their workplace. A significant knowledge gap was observed concerning the classification of pharmaceutical waste types especially cytotoxic, hormonal, and controlled substances which require specialized disposal processes. Approximately 31% of respondents were unaware of the environmental implications of discarding antibiotics and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) through general waste streams, underscoring the need for further professional education in this area.

In terms of practice, 65% of pharmacists indicated that their workplaces had some form of pharmaceutical waste disposal infrastructure, but only 42% confirmed routine segregation and documentation practices. Urban pharmacies were more likely to utilize certified waste management services, while rural outlets often relied on local municipal waste collection, which may not meet pharmaceutical-grade disposal standards. Interestingly, pharmacists in hospital settings exhibited better adherence to hazardous waste guidelines compared to those in community settings, likely due to stricter institutional protocols and periodic inspections.

The study also explored the role of pharmacists in public education. Only 36% reported regularly informing patients about proper disposal methods for unused medications, despite over 70% agreeing that public participation is crucial for effective waste management. Barriers cited included time constraints, lack of informational leaflets, and the absence of national campaigns or guidance from regulatory bodies. Pharmacists expressed the need for more institutional support, with 79% requesting standardized training modules and national policy enforcement on pharmaceutical waste handling.

From a policy perspective, Austria has made strides in environmental sustainability, yet pharmaceutical waste disposal remains inconsistently regulated across regions. While national guidelines exist, they are often outdated or poorly disseminated among frontline healthcare workers. Pharmacists in this study called for more visible enforcement by environmental and healthcare authorities, as well as integration of disposal practices into pharmacy curricula and continuing professional development programs.

The results indicate that enhancing awareness among pharmacists is not merely a matter of professional ethics but a necessary public health intervention. Pharmacists are well-positioned to serve as educators, enforcers, and change agents in the promotion of safe disposal practices, provided they are equipped with the appropriate tools and institutional backing. This includes the provision of color-coded bins, access to certified disposal agencies, and informational resources for patients.

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In conclusion, this cross-sectional analysis highlights the urgent need to strengthen pharmaceutical waste disposal awareness and practices among pharmacists in Austria. While the awareness of environmental risks is relatively high, discrepancies in knowledge, practical adherence, and patient engagement remain significant challenges. Bridging these gaps requires a multifaceted approach comprising policy reinforcement, professional training, infrastructure investment, and community outreach. As Austria continues to champion environmental sustainability, the

integration of pharmacists into the broader waste management framework will be crucial in safeguarding both ecological and public health. The study recommends that national pharmacy boards collaborate with environmental agencies to update disposal protocols, roll out targeted training sessions, and launch public awareness campaigns involving pharmacists as frontline advocates for pharmaceutical waste stewardship.