Extending Shelf Life Just Makes Sense

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Since 1979, the US Food and Drug Administration (FDA) has required pharmaceutical companies to provide rigorous proof that their medication is stable over the course of months when submitting a New Drug Application or an Abbreviated Drug Application. A medication’s shelf life, or expiration date, is the time frame in which a medication has been proven safe and effective despite exposure to various environmental factors including temperature, humidity, and light. Although expiration dates guarantee a certain length of stability, the FDA has no requirement for long-term testing. Many medications may have much longer shelf lives than labeled.

The best evidence indicating that medications can last longer than their labeled expiration date comes from the Shelf Life Extension Program (SLEP). Rather than disposing of billions of dollars of the military’s stockpiled medications that were set to expire in the 1980s, the FDA tested various batches of the medications in their supplies to provide extensions in shelf life. In their studies of 122 different medication products, nearly 90% met the requirements for an extension. Table 1 includes medications for which all lots tested approached their expiration dates met the criteria for initial shelf life extension, and Table 2 lists medications for which less than 50% of lots tested were initially extended. Whereas the shelf life of most medications in the United States is 1 to 5 years, the average additional extension length by SLEP was 5.5 years, and some lots were extended by more than 20 years.

Cantrell et al, in another study, tested medications that had expired 28 to 40 years earlier that were discovered unopened and in their original containers at a retail pharmacy. Twelve of the 14 active ingredients were present in at least 90% of the labeled amount, meeting our standard of acceptable minimum potency. Given these data, it seems that many labeled expiration dates do not reflect true longevity.

Despite extensive federal data on the long-term quality of many medications, shelf life extensions that occur in our national stockpiles do not transfer to state or local supplies, let alone hospitals, pharmacies, and those of individual patients, although more accurate expiration dates could reduce costs. As an example, Tufts Medical Center in Boston, Massachusetts, disposes of approximately $200,000 worth of expired medications per year (written personal communication, Department of Pharmacy at Tufts Medical Center, January 8, 2015).

The current standards for shelf life assignment are especially troublesome when populations that are unable to afford medications are considered. Infrastructural obstacles can delay health care distribution in developing countries, but medications cannot be donated internationally if they do not meet the donor country’s standards. A donated drug that reaches a developing country past its stated expiration date must be discarded, although SLEP evidence suggests longer-term stability. Furthermore, it is illegal to dispense expired medication to any American regardless of whether they can obtain it otherwise.

Longer shelf lives could also play a role in decreasing medication shortages. Many medication shortages occur for an unknown reason and without warning. If we had evidence that medications were stable for longer periods, pharmacy operation managers might have more flexibility to avoid shortages and paying the higher prices that are often associated with medications in short supply. Of the 15 medications that SLEP determined to be top performers in shelf life extension, 12 (80%) are currently in shortage or have been in shortage since 2013. Extending the expiration dates for these medications could possibly help some providers, pharmacists, and patients during medication shortages.
Finally, it is possible that extending shelf lives could have a positive environmental effect. Scientists recently found evidence of contamination by many medications in water and sediment samples from Lake Michigan at concentrations that pose "medium or high ecological risk." If longer shelf lives could reduce medication disposal, perhaps such a measure could also abate harmful environmental consequences.

How do we implement a policy to establish more accurate expiration date labeling? One option is to require all pharmaceutical companies to complete long-term stability testing. Just as pharmaceutical companies must conduct ongoing monitoring for adverse effects after releasing a new medication, they could continue efficacy testing to see how long their medications truly last. Expiration dates could be preliminary and then updated. A second option is to create noncommercial, independent testing for the true lengths of medication stability. SLEP has provided the chemistry and protocol for ongoing testing, and a similar protocol could be applied for civilian medications. Perhaps the FDA or the US Pharmacopeial Convention could preside over this initiative. These proposals would require funding, but the potential benefits of such initiatives at least deserve consideration of their feasibility.

Or, we could take the current data from SLEP and extend expiration dates for top-performing medications, before they are dispensed, that have already been monitored for years. If the ciprofloxacin in the federal supplies was active for more than 20 years, the FDA might consider granting this medication a shelf-life extension for the general public as well, at least in pharmacies that have maintained optimal storage conditions. At a minimum, individual states that keep supplies of medications in proper storage conditions so as to respond to a pandemic or terrorist attack before federal supplies arrive should be able to use SLEP data to extend the shelf lives of medications in their local stockpiles.

Even the age-old adage of particular expired medications being toxic may no longer be true. Although degraded tetracycline is thought to cause renal tubular insufficiency,
manufacturing was changed decades ago to substantially reduce the likelihood of tetracycline formulations breaking down. Of course, subsequent monitoring for and reporting of adverse effects in medications of extended shelf life would be essential for ensuring patient safety; however, controversies from decades ago may need to be revisited for their validity.

For most medications, the concern is for loss of potency under imperfect conditions more than for degraded metabolites that are toxic. One could argue that people do not always keep their medications in ideal conditions, as occurred with our federal supplies. This is a valid concern given our currently limited understanding of long-term drug stability, but investment in rigorous testing and surveillance could resolve this uncertainty.

Whereas many decisions in health care must balance the competing interests of cost and quality, extending expiration dates to reflect the true amount of time that a medication is safe and effective might sacrifice neither. Implementing such a measure could decrease the amount of money spent on prescription medications in the United States due to reduced medication disposal and could also improve health care quality by improving access to pharmacologic treatment.

The logistics of implementing shelf life extensions for the general population would not be simple, but the remarkable evidence provided by SLEP indicates that careful consideration is deserved. It only makes sense.

Expiration dates guarantee a certain length of stability, but many drugs may have much longer shelf lives than is labeled because there is no requirement for long-term efficacy testing. SLEP, pioneered by the FDA to conserve drugs stockpiled by the military, provides convincing data about the safety and efficacy of many medications past their expiration dates. If we were to apply shelf life extensions more broadly, it might be possible to reduce national health care costs, reduce drug shortages, and provide medications to those who would otherwise be unable to afford them.

ACKNOWLEDGMENTS

We thank Tiffany Lieu, MD, for her help with the literature search.
Abbreviations and Acronyms: FDA = Food and Drug Administration; HCl = hydrochloride; SLEP = Shelf Life Extension Program

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