Elderly patients are often prescribed potentially inappropriate medications (PIMs) during their hospital stay, which are still present at discharge. It is, however, unknown where these PIM therapies are initiated (ie, before hospital admission or in the pre-intensive care unit [ICU] ward, ICU, or post-ICU ward) and if they are stopped or continued across care transitions within the hospital. Furthermore, it is unclear if these PIMs are actually inappropriate medications (AIMs), given the patients' underlying medical condition. We evaluated medication appropriateness in a cohort of critically ill elderly patients, assessing the number and types of PIMs and AIMs at hospital discharge and determining their source of initiation.

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Methods. This prospective cohort study included patients 60 years or older at an 800-bed academic hospital who were discharged after receiving care in a medical, surgical, or cardiovascular ICU for shock or respiratory failure. We excluded patients who died during hospitalization or were discharged to hospice. Informed consent was obtained initially at enrollment from an available surrogate; patients provided consent when competent. The institutional review board of Vanderbilt Medical Center, Nashville, Tennessee, approved the study.

Demographics and severity of illness were recorded. Medications prescribed at up to 5 distinct time points—before admission (ie, outpatient medications recorded at the time of admission), ward admission (ie, outpatient medications that were continued at admission plus newly prescribed inpatient medications), ICU admission, ICU discharge, and hospital discharge—were abstracted from the electronic health record.

Potentially inappropriate medications were defined using the 2003 Beers criteria and supplemented with additional medications from more recently published medication safety scales or lists. The PIMs were evaluated to determine if they were actually inappropriate (ie, AIMs) based on the patient's medical status by a clinical panel that comprised a hospitalist, geriatrician, and clinical pharmacist. Via the hospital's integrated electronic health record, the clinical panel reviewed the patient's medical history, clinical course, hospital discharge medications, and laboratory data, including creatinine clearance, to determine if each PIM at hospital discharge was actually inappropriate. A PIM was considered an AIM when at least 2 of the 3 members of the clinical panel considered it inappropriate for the patient based on criteria specified in the Medication Appropriateness Index, including indication, dosage, and likely effectiveness, as well as drug-drug interactions and drug-disease interactions. This approach was designed to simulate multidisciplinary clinical decision making on rounds, and therefore we did not calculate χ² statistics.

Patients' demographic and clinical variables were summarized using median and interquartile range (IQR) for continuous variables or percentages for categorical variables. The numbers of PIMs and AIMs prescribed per patient were described and analyzed as continuous variables. We used the Wilcoxon signed rank test to compare the distribution of preadmission PIMs per patient to the distribution at hospital discharge. We used R software (version 2.11.1; R Foundation for Statistical Computing, Vienna, Austria) for all statistical analyses. P < .05 was considered statistically significant.

Results. We enrolled 120 patients, whose median age was 68 years (IQR, 66-74 years) and Acute Physiology and Chronic Health Evaluation II score at ICU admission was 27 (IQR, 20-32). The percentage of patients prescribed at least 1 PIM increased from 66% before admission to 85% at discharge. The number of patients with 0 PIMs dropped from 34% before admission to 14% at discharge, and the number of patients with 3 or more PIMs increased from 16% before admission to 37% at discharge. (Figure, A) Overall, the number of PIMs prescribed per patient at hospital discharge was significantly higher than before admission (median [IQR], 2 [1-3] vs 1 [0-2]; P < .001). Importantly, 50% of the PIMs at hospital discharge were first prescribed in the ICU; only 20% were first prescribed on the hospital wards and 30% were present before admission.

Among the 103 patients with 1 or more PIMs at hospital discharge, 59% had at least 1 AIM. The distribution of AIMs is shown in the Figure, B. Most (59%) of the AIMs at hospital discharge were first prescribed in the ICU; 20% were first prescribed on the wards and 21% were present before admission.

Comment. Advances in critical care medicine have led to a greater number of elderly ICU survivors. These survivors experience polypharmacy and numerous transitions in care during hospitalization and are at high risk of adverse drug effects after hospital discharge. In the present study, 85% of elderly ICU survivors were discharged from the hospital with 1 or more PIM. A unique aspect of our study, and a concerning finding, was that...
more than half of these patients were discharged with 1 or more AIM, medications deemed more harmful than beneficial to the patient. Similarly, Hajjar et al found that 44% of elderly veterans were prescribed at least 1 AIM at hospital discharge. In our cohort, half of PIMs and, more importantly, the majority of AIMs at hospital discharge were initiated in the ICU. While it is possible that these drug therapies may be appropriate when started during the course of an acute illness in the ICU (eg, stress ulcer prophylaxis with H2 antagonists in mechanically ventilated patients), most should have been discontinued at ICU and/or hospital discharge.

Our study highlights the importance of performing an evaluation of medication appropriateness during reconciliation of medications at hospital admission, ICU discharge, and hospital discharge. The increase in PIMs and AIMs may reflect multiple unique challenges that include inadequate standardization of medication reconciliation procedures at transition of care, poor communication between ICU- and ward-based physicians, and inadequate understanding of the dangers of individual medications in the high-risk elderly population.

Given the high prevalence of PIMs and AIMs among elderly survivors of critical illness, physicians practicing in the ICU and hospital wards should be more attentive to the appropriateness of continuing medication therapies started in the ICU. Better coordination is needed at this transition point, with attention to the rationale for starting each medication therapy in the ICU and discussion of when it can be stopped. Potential solutions for reducing inappropriate medications may include electronic medical record surveillance, routine clinical evaluation (eg, geriatrician and clinical pharmacist), and/or improved hand-off communication between discharging and accepting health care providers. Incorporating this assessment of medication appropriateness into the medication reconciliation process when patients are discharged or transferred out of the ICU has the potential to enhance patient safety.

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Nonmedical Use of Opioid Analgesics Obtained Directly From Physicians: Prevalence and Correlates

In light of significant risks associated with opioid use, physicians are encouraged to monitor patients to whom they prescribe them.1,2 Guidelines have endorsed physician-initiated treatment agreements and urine drug testing,3 despite equivocal efficacy.4 Nonmedical use of opioids has increased in conjunction with opioid prescribing and is associated with addiction, overdose, and death. To understand the impact physicians can have on nonmedical use of opioids, studies that examine the sources of these opioids are needed. This study investigates the source of opioids used nonmedically, the features of patients who obtain these opioids from physicians, and the extent to which nonphysician sources are used.

Methods. Data Source and Study Population. We used data from the National Survey on Drug Use and Health, an annual survey of the civilian, noninstitutionalized population. We restricted our analysis to those 18 years and older and combined survey data from 2006 through 2008.

Study Variables. Respondents who indicated that they had “used [an opioid analgesic] that was not prescribed for you or that you took only for the experience or feeling it caused” in the past month were asked for the source(s) of the opioids. We divided sources into 2 groups: (1) “physician,” which included the responses “single physician” or “2 or more physicians,” and (2) “nonphysician,” which included the responses “free from friends or family,” “purchase from friends or family,” “purchase from a dealer,” “purchase from the Internet,” “prescription forgery,” “theft from friends or family,” “theft from physician offices,” and “theft from a pharmacy.” Respondents were classified into (1) having a physician source, including those who indicated a physician source with or without also indicating a nonphysician source and (2) having only nonphysician sources.

Age, sex, race/ethnicity, income, education, employment, and marital status were included as covariates. Data on lifetime and current (past year) substance use and dependence were obtained via self-report.2 Three binary substance use disorder variables were created: past-year alcohol abuse or dependence; past-year opioid analgesic abuse or dependence; and past-year other substance (stimulants, hallucinogens, heroin, inhalants, marijuana, and/or sedatives) abuse or dependence. The Kessler 6 inventory was used to measure psychological distress.6 Overall health was based on the question, “Would you say your health in general is excellent, very good, good, fair or poor?”

Statistical Analysis. We evaluated multivariable associations between independent variables and the binary dependent variable (having a physician source of opioid analgesics) using logistic regression. We then restricted the sample to those respondents with a physician source of opioids and performed frequencies of nonphysician sources. We used SAS version 9.1 (SAS Institute Inc, Cary, North Carolina) and SUDAAN version 9.0.1 (Research Triangle Institute, Research Triangle Park, North Carolina) to account for the sampling methods and nonresponse, using sample weights that normalized data to annual census distributions.

Results. From 166 453 respondents, 3238 were 18 years or older, reported nonmedical use of opioids, and indicated an opioid source. Of the 3238 respondents, 855 (30.7%, percentage adjusted for sampling strategy) reported having a physician source of opioids.