INTRODUCTION

Patient compliance with treatment is essential. However, it is difficult to examine the issue of compliance from claims and administrative databases that include no direct input from patients. In order to measure compliance, we now have to define a meaningful compliance score within the administrative database. One way of doing this is to investigate patient medication information. Patients with chronic diseases taking maintenance medications usually receive a 30-day or 90-day supply on a regular basis, as long as they are taking the medications at the required intervals. Therefore, one way we can examine the level of compliance is by measuring the time intervals between medication refills.

For example, we can examine insulin medications. In particular, in the Medical Expenditure Panel Survey data, the medication, dose, and quantity are all provided. The multiple prescriptions per patient are also recorded, so we can determine the number of prescriptions in a year and the total number of doses can be identified. For Type II diabetes, a medication can be prescribed once a day. Then, there should be approximately 365 doses in a year for that particular patient. A patient who has only 120 doses in a year is clearly not complying with the required medications. We can then use the ratio of the number of actual doses divided by the number of doses needed for full compliance to define a compliance score. This measure will work very

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well when there are generally one or two doses of a fixed amount. When patients can take many different doses, compliance will be a little more difficult to define.

**BACKGROUND**

Patient compliance is a difficult thing to measure. (Chatkin, et al., 2006; Kaiser, 2007; Klauer, Zettel, Klauer, & Zettel, 2008; Lasmar, et al., 2007; Sungkanuparph, et al., 2008) Yet it is well known that patient compliance improves patient outcomes. (Z. Chen, et al., 2009; Cochrane, Bala, Downs, Mauskopf, & Ben-Joseph, 2000; Greengold, et al., 2009; N. Koh, et al., 2008; McCarthy, Datta, Khachatryan, Coleman, & Rachet, 2008; Raju, Hollis, & Neglen, 2007; Sunyecz, Mucha, Baser, Barr, & Amonkar, 2008) For this reason, studies have been conducted to examine the impact of interventions on patient compliance. (Cotte, et al., 2008; Giuffrida & Torgerson, 1997; Hoevenaars, et al., 2008; Jansen, et al., 2009; Klein, et al., 2009; N. Koh, et al., 2008; Llor, et al., 2009; O’Reilly, 2007; Opstelten, et al., 2009; Raju, et al., 2007; VanHecke, Grypdonck, & Defloor, 2008) These intervention studies usually require the actual measure of patient doses taken; unused pills are counted. Therefore, they are very expensive and conducted with a small number of patients.

Other studies suggest that compliance should be measured using electronic monitoring devices. (J. R. Curtis, et al., 2009) The device records a positive signal whenever a dose is taken. However, again such devices are expensive, and the resulting studies will be small.

There are also issues with compliance on the part of the medical staff, including such basics as washing hands between patients or tasks. Therefore, both patient and caregiver compliance with routine tasks should be examined. (Creedon & Creedon, 2008; Samraj, Westbury, Pallett, & Rowen, 2008) In addition, compliance with treatment guidelines on the part of the caregivers should be considered. (Mol, et al., 2005) It is possible that the provider is using some nonstandard treatment and disregarding protocols.

One recent study concerning the use of the medication, Lipitor, used pharmacy records to identify the number of refills to define patient compliance. (Frolkis, et al., 2002; Lachaine, et al., 2006) One of the issues we have to consider is just how to define compliance. For example, if a medication should be taken once a day, there should be 365 doses prescribed in a year’s time. There has to be some allowance so that we accept, say 345 doses as full compliance. What kind of compliance is 250 doses? Should there be a ranking of compliance, or should there be a 0-1 indicator function defined as compliance versus not compliance?

Similarly, medications to treat osteoporosis have now been developed for once a week, once a month, or once a year treatment. We need to monitor the prescriptions of such medications to see if patients continue with compliance. In order to do this, we must first define a measure of compliance.

**DEFINITION OF COMPLIANCE USING EXAMPLE OF OSTEOPOROSIS**

In the 2006 MEPS data for medications, there are close to 350,000 prescriptions listed. We want to restrict attention to the few used exclusively to treat osteoporosis. These include Fosamax, Actonel, Evista, Boniva, and Reclast. A complete list of these medications used for both treatment and prevention is given below (available from http://www.webmd.com/osteoporosis/tc/osteoporosis-medications):

- Bisphosphonates, such as alendronate (Fosamax), ibandronate (Boniva), and zoledronic acid (Reclast), which slow the rate of bone thinning.