The Impact of Immunization Record Aggregation on Up-to-date Rates—Implications for Immunization Registries in Rural Areas

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ABSTRACT: *Problems with poorly documented immunization records may be especially important in rural areas. To evaluate the potential impact of a regional registry in a rural region, this study quantified the change in documented immunization rates for nine primary care sites in rural Colorado resulting from the addition of public health department immunization clinic records. Manual chart reviews of immunization data were conducted at both private primary care and public health department sites in two geographic areas in rural Colorado. Data from private primary care sites were matched to data from the public health department sites. Immunization up-to-date (UTD) rates at each primary care site were then recalculated for 12- and 24-month-olds after including data from public health department sites. Of 1,533 children, 469 (31 percent) were given immunizations at both a private primary care and a public health department site. The UTD rate (3:2:3:2) of 12-month-olds using only data from primary care sites ranged from 32 to 79 percent. Including the public health department data increased the rates by 0 to 26 percent (mean =11 percent) for 12-month-old children. The UTD rate of 24-month-olds (4:3:1:3 and any Hib on/after 12 months) ranged from 6 to 54 percent at the primary care sites. These rates increased by 6 to 21 percent (mean =12 percent) when public health department data were added. This "virtual" registry combining primary care and public health department data increased calculated immunization rates at primary care sites substantially, with a range of 0 to 26 percent.*

Timely vaccination in the United States has dramatically decreased childhood morbidity and mortality in the past 50 years (Hinman and Orenstein, 1999) and is the most cost-beneficial preventive service available for children (Miller and Hinman, 1999). Since 1994, a single routine immunization schedule has been endorsed by the American Academy of Family Physicians, the American Academy of Pediatrics' Committee on Infectious Diseases and the federal Advisory Committee on Immunization Practices (Rodewald, et al., 1999). Despite this, 1996 data from the National Immunization Survey suggest that only 78 percent of 2-year-old children in this country have received a complete basic immunization series (Centers for Disease Control and Prevention [CDC], 1997a) and rates for inner city areas, minority populations and some rural populations are substantially lower (CDC, 1997b,c; Lowery, et al., 1998; Williams, et al., 1994).

There are a variety of sociodemographic factors that

may put children living in rural areas at high risk for underimmunization (Lowery, et al., 1998). Also, because the practice of referring patients to public health departments is common in rural areas (Hueston, et al., 1994; Mainous, et al., 1993), children are likely to have providers in both the public and private sectors and to be at risk of having poorly documented immunizations. Problems with record scatter may be especially important in rural areas in which children have providers in multiple counties or where distances between providers are large.

For more than a decade, the National Immunization Program of the Centers for Disease Control and Prevention has advocated the development of automated and accessible immunization registries (National Vaccine Advisory Committee [NVAC], 1994). Such systems can be used to monitor and track immunization records and to generate reminder and recall notices to underimmunized children (Institute of Medicine, 1994; NVAC, 1994). Previous studies have shown that tracking and reminder systems can significantly increase immunization rates (Byrne, et al., 1970; Klachko, et al., 1989; Linkins, et al., 1994; Loeser, et al., 1983; Szilagyi, et al., 1992; Tollestrup and Hubbard, 1991; Young, et al., 1980). Although state or community-based registries have been developed in the past several years (Linkins and Feikeme, 1998), there is little published information on the impact of registries on calculated immunization up-to-date (UTD) rates for primary care practitioners. This study quantified the change in calculated immunization rates for nine primary care sites in rural Colorado resulting from the addition of public health department records.

Methods

The Colorado Rural Immunization Services Project (CRISP) is a Centers for Disease Control and Prevention-funded demonstration project designed to increase rates of childhood immunization in medically underserved areas in rural Colorado. The CRISP project is working in a region of five counties in the northeast section of the state and a region of six counties in the south-central portion of the state referred to as the San Luis Valley. Both regions are primarily agriculture based and both employ many seasonal or migrant workers. Colorado live birth statistics from 1997 indicate that 65.5 percent of the live births in the northeast were white/non-Hispanic, 33.2 percent white/Hispanic, 0.3 percent African American, and 0 percent American Indian. The corresponding numbers for the San Luis Valley were 46.4, 51.2, 0 and 1.1 percent, respectively.

At the time of the study in 1998, regional registries were under development in both regions. The registries were based on health service delivery patterns rather than on political or administrative criteria. In the San Luis Valley, the region is effectively defined by a mountain range, whereas in the northeast, an extensive network of public health clinics provides care to the entire region.

To assess the potential impact of these regional registries, chart review data were used to simulate their contents. Chart reviews were conducted by trained chart reviewers at primary care practices and public health department sites between February and December 1998 in both regions.

Two age groups, 12- to 18-month-olds and 24- to 30-month-olds, were studied. Data were collected on 75 children per age group per primary care site or on all children if there were less than 75 children per age group. Children who had documentation in their charts that they had moved or were going elsewhere for care were excluded and another child was included if available. Data were collected from five primary care sites in the northeast and four primary care sites in the San Luis Valley. These sites were selected because they were the largest providers of primary care for children in their regions, serving an estimate of approximately 75 percent of children in the northeast and more than 90 percent of the children in the San Luis Valley. Data were also collected from the regional public health department in the northeast that serves all five counties and from two county nursing services in the San Luis Valley. In these areas, the public health department sites provided immunizations but no primary care.

The outcomes of interest were the calculated up-to-date rates at 12 months (3 DPT, 2 polio, 3 HepB, and 2 Hib) and 24 months of age (4 DPT, 3 polio, 1 MMR, 3 HepB, and any Hib on or after 12 months) using the Valid Doses report from the CDC's WinCASA software (WinCASA, 1999). This method of calculating UTD rates assures proper spacing between the last two doses in the series and also assures that MMR was given after one year of age.

After data were collected and duplicate children

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Table 1. Study Population.

Region	Number of Children	Number With Matches in Public Health Department Data	Percent Seen at Both a Primary Care and a Public Health Department Site (%)
Northeast	941	299	32
San Luis Valley	592	170	29
Total	1533	469	31

eliminated, a matching procedure was run between the primary care sites and the corresponding public health site in the region. Children with the same first name, last name and date of birth were identified as matches. Because the two regions are geographically distinct, the study populations from the two regions were considered separately. Immunizations that were reported in the public health department data but not in the primary care practice data were then added to the primary care data, and UTD rates were recalculated using these combined data.

Results

The study population contained 1,533 children, 941 in the northeast and 592 in the San Luis Valley. As Table 1 shows, 31 percent of children (32 percent of children in the northeast and 29 percent in the San Luis Valley) who had visited a primary care site had also received at least one immunization at a public health department. Table 2 shows the UTD rates for 12- and 24-month-olds in the northeast and San Luis Valley, using both the primary care data alone and the combined data. The number of children at each site varied widely (range 14 to 76 for 12-month-olds; 8 to 76 for 24-month-olds), as did the measured UTD rates (range 32 to 79 percent for 12-month-olds; 6 to 54 percent for 24-month-olds). The mean increase in UTD rate resulting from the matching of primary care and public health department data for 12-month-olds was 11 percent, with a range of 0 to 26 percent. The mean corresponding increase in UTD rate for 24-month-olds was 12 percent, with a range of 6 to 21 percent. For both

Table 2. Calculated Up-to-date Immunization Rates for 12- and 24-Month-Olds in Two Regions in Rural Colorado.

	UTD at 12 Months			UTD at 24 Months		
Primary Care Site	Number of Children	Primary Care Only (%)	Combined (%)	Number of Children	Primary Care Only (%)	Combined (%)
NE1	14	79	79	8	50	71
NE2	18	72	72	28	54	68
NE3	74	51	64	76	9	16
NE4	76	49	74	73	6	11
NE5	71	63	70	71	13	21
SLV1	66	32	45	67	25	35
SLV2	55	38	51	57	25	35
SLV3	15	33	46	33	15	32
SLV4	20	40	60	15	20	33

Note: Combined=primary care and public health department.

12- and 24-month-olds, six of the nine practices had UTD rate increases of at least 10 percent.

Discussion

Centralized immunization registries with the capacity to link records from multiple providers are becoming the new gold standard measure of immunization status (Rodewald, et al., 1999). Regional registries may be especially helpful to practitioners in rural areas, where patients often get immunizations at both private and public sites, sometimes in multiple administrative structures and counties. Providers in such settings may assume their patients are using a public health site for immunizations and are up-to-date. A registry may improve their delivery of care by identifying patients who are, in fact, not fully immunized. Conversely, providers in rural settings, whose quality of care is increasingly being judged on the basis of measures such as organization-specific immunization rates, will benefit enormously if centralized data can demonstrate that their up-to-date rates are actually higher than their records show. This study demonstrated that, for primary care practitioners in rural

Colorado, the addition of records from local public health departments resulted in increases in immunization rates of 11 to 12 percent on average but up to 26 percent for some practices.

Children in rural areas may be at high risk for both underimmunization and for poorly documented immunization rates (Lowery, et al., 1998). Rural residents tend to be poorer and less educated than urban residents and are more likely to be uninsured (DeFriese and Ricketts, 1989; Lowery, et al., 1998; McManus and Newacheck, 1989; Norton and McManus, 1989; Office of Technology Assessment, 1990), all factors associated with lower immunization rates (CDC, 1994; Gergen, et al., 1988; Houtrouw and Carlson, 1993). The sparsely populated nature of many rural communities, the mobility of families with agricultural worker parents and the high prevalence of native languages other than English within some communities present problems in transportation, record keeping and interaction with health care systems (Deutchman, et al., 2000). Differences in health care delivery in rural vs. urban areas also may affect immunization delivery. Rural providers have been shown to see a higher volume of patients during office hours and to spend less time on patient visits (Harris and Leininger, 1993). Referral of patients from private practices to health department vaccine clinics continues to be a frequent occurrence, varying in published reports from 44 to 90 percent (Zimmerman, et al., 1997). A recent study of rural providers in Colorado showed that 75 percent referred at least some of their pediatric patients to public health departments for immunizations (Deutchman, et al., 2000). Several studies have suggested that rural primary care providers are reducing provision of immunizations, requiring children to obtain immunization at public health departments, thereby increasing the problem of record scatter (Heuston, et al., 1994; Mainous and Heuston, 1993). Some of the reasons cited by these providers for referring patients are more likely to occur in rural areas, such as the expense of having to maintain stores of fresh vaccine in practices with few children and inability to obtain records from providers in other counties and communities.

If registries are established in a regional fashion, how much can they decrease record scatter and increase calculated immunization rates in rural areas? There are little data that address this question and none in predominantly rural areas in this country. In 1998, Yawn, et al., compared the immunization rates for 2-year-olds in two large private health care facilities and one public health site, with the rates obtained after all recorded immunizations were combined from all facilities in a simulated registry. They showed relative increases in calculated immunization rates of 6.9 , 14.0 and 27.7 percent for the three sites after addition of data from the simulated registry. This study was conducted in Olmsted County, Minnesota, a predominantly white, upper middle class region with a large percentage of the population employed in health care services and 85 percent of children receiving care at one of two major health care facilities. In addition, only 13 percent of the population studied received immunizations at more than one site. These factors limit the generalizability of this study to many rural areas in which record scatter is a larger issue and the socioeconomic status of the population is more diverse.

The current study examined the impact of combining immunization records from primary care practitioners and public health departments in rural Colorado. Here, approximately one third of children obtained care at both a primary care site and at the public health department. These data underscore the lack of documented immunizations in rural Colorado. The rates reported for the individual practices studied are lower than national figures for rural practices based on self-report, recently reported to be 63.0 to 67.8 percent (Zimmerman, et al., 1997). Our rates were lower partially because they were based on the Valid Doses Only Report in CASA. These rates also are likely to be more reflective of record scatter in rural areas than they are of underimmunization.

These findings provide a conservative estimate of the potential benefits of a regional registry to a rural practitioner. The current study combined data only from single primary care sites and local health departments. Increasing the merged data to all immunization providers in the region, including community health centers and migrant worker health programs, would undoubtedly further increase immunization rates. In addition, this study did not aggregate data for individual patients in multiple primary care sites, which might increase rates even further. Nevertheless, this study suggests that substantial gains in the documentation of immunization status can be made with the use of a centralized registry, particularly in rural areas where the use of multiple providers is common.

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