

SPHERE: Tracking Public Health Improvement with Electronic Records

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Introduction

Increasingly, public health relies on information science to assist decision-making and assess health from the individual to the statewide level. Modern public health practice requires access to advanced, networked, computer-assisted technology in order to effectively monitor disease, analyze and detect risks, provide decision support, alert and communicate, educate and train, manage public health response, and measure effectiveness.¹ Accordingly, “integrated electronic data and information systems” is a Wisconsin 2010 Health Plan infrastructure priority.²

Wisconsin’s Public Health Information Network (PHIN) is being developed to meet these requirements. The Wisconsin PHIN is a secure on-line network advanced by the Wisconsin Department of Health and Family Services (DFHS) to support the essential

public health services.³ One component of the Wisconsin PHIN is the Secure Public Health Electronic Record Environment (SPHERE). SPHERE is used to document and evaluate public health activities and interventions at the individual, household, community, and system level. The purpose of this article is to describe SPHERE development, security features, functions and uses, demonstrate potential SPHERE applications, and discuss how ongoing SPHERE initiatives will continue to enhance public health’s core function of assessment.

SPHERE Development

SPHERE is the principal reporting tool for 3 public health programs with federal, state, and local reporting requirements: Maternal and Child Health (MCH), Family Planning/Reproductive Health, and Children and Youth with Special Health Care Needs. These MCH-related programs use SPHERE to securely transmit birth record data and to document, monitor, and evaluate a number of MCH activities including case management and home visitation, referrals and outcomes, immunizations and other preventative services, as well as standardized prenatal, post-partum, home safety, and child passenger seat assessments.

In order to meet the various needs and practice settings of MCH

programs and interventions, 3 goals guided the development process of SPHERE: to create an unduplicated client list to comply with updated reporting and surveillance guidelines, to create a centralized database with role-based access, and to standardize public health activity, intervention, and outcome reporting at the individual, household, community, and system level.

A Federal MCH (Title V) Program Grant funded SPHERE development through a collaborative process, facilitated by staff from DHFS Division of Public Health, Bureau of Community Health Promotion. A lead team of state, regional, and local health department staff met to outline policy and business rules governing the development of SPHERE. The University of Wisconsin-Madison Department of Information Technology (DoIT) collaborated with design teams to develop the screen displays and reporting capabilities. In addition to health department staff, tribal health officials and other community partners including private and non-profit agencies participated in this process.

The lead team identified the Minnesota Public Health Intervention Model as a comprehensive framework to best meet the primary functions of SPHERE.⁴ This model was developed at the Minnesota Department of Health, with input from partner-

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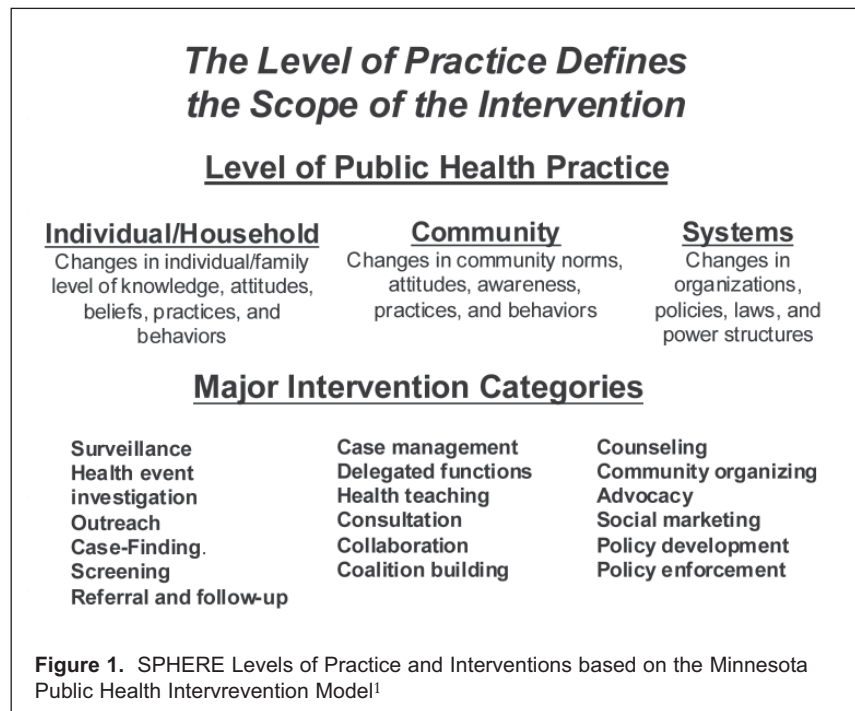
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ing health departments in Iowa, North Dakota, South Dakota, and Wisconsin. This model was chosen based on its ability to begin from a common starting point, yet be applied to many different practice settings. By defining a level of practice and selecting the appropriate public health intervention, the SPHERE framework is adaptable to the needs of an individual organization, and allows a broad range of programs to report ongoing activities. The SPHERE framework also encourages research-tested and evidence-based practices to be used throughout the state. An example of this is the standard reporting of the Ages and Stages Developmental Assessment screening tool for organizations that serve infants and children (see Figure 1).

SPHERE became available for use in August 2003, and by the end of 2006 over 131,000 unduplicated clients were entered into SPHERE. Currently, over 1350 users representing 150 organizations throughout Wisconsin use SPHERE to document service delivery, client health status, and outcome measures.

SPHERE Security

SPHERE was created under the authority granted to the Maternal and Child Health Bureau of DHFS under Wisconsin Statutes 250.04 and 253.02. To assure a client's right to privacy and confidentiality, HIPAA rules and the SPHERE Security and Confidentiality Policy require organizations and employees to complete training that demonstrates proficiency in data handling procedures. SPHERE also uses role-based access for an additional level of security. Individual organizations are responsible for appointing a Local Organization Administrator, who is responsible for assigning appropriate levels of access to their staff. The role-based



security feature allows individual organizations, managers, and employees to only view data appropriate to their role. This security structure also enables an organization to maintain control over the data they enter into the system.

One significant achievement of SPHERE is the secure, automatic transmission of the birth record. SPHERE is updated daily with birth record data, and role-based security enables birth data to be viewed by programs serving the infant's area of residence. Because the birth record serves as an entry point for many of the MCH-related services in Wisconsin, this SPHERE feature has made essential information readily available for timely service delivery. DHFS SPHERE administrators conduct regular audits to assure compliance with current HIPPA standards.

SPHERE Utilization

The Federal and State MCH administrators share responsibility for establishing program objectives, and progress is measured using SPHERE data reports. A SPHERE

report generation feature has been developed to de-identify data and provide valuable feedback while maintaining client security and confidentiality. Program managers can compile and summarize program-specific data through standard preset reports, as well as customized reports. For example, the program manager can use SPHERE to monitor performance of an employee or group of employees, as well as health outcomes of a client or client population. The data can be used for a variety of purposes, such as to

- comply with program reporting requirements for state and federal grants
- document needs in the community for strategic planning purposes
- track quality indicators for specific services, processes, and outcomes
- monitor trends related to workforce, client health status, and service utilization

Reports can also be created on the aggregate level for multiple organizations, and DHFS SPHERE administrators can compile de-

Table 1. SPHERE Summary: Referrals with Outcomes for Selected Health Services, Benefits, and Other Health Related Funding, 2006*

Type of Health Service	Referral Outcome									
	Lost to Follow Up		Receiving Services [†]		Incomplete Services, Client Barrier [‡]		Incomplete Services, Provider Barrier [§]		Total Referral Outcomes	
	No.	%	No.	%	No.	%	No.	%	No.	%
Economic Support Services [¶]	35	2	1150	79	253	17	26	2	1464	100
Reproductive Health Services ^{**}	10	2	350	83	57	14	5	1	422	100
Dental Services ^{††}	25	4	267	44	214	36	95	16	601	100
Routine Childhood Immunization Services	10	2	357	85	44	10	9	2	420	100
Prenatal Care Services ^{‡‡}	32	5	495	75	124	19	6	1	657	100
Physician Provided Services ^{§§}	34	2	1652	86	229	12	10	1	1925	100
Total N and Average % for Selected Referrals and Outcomes	146	3	4271	78	921	17	151	3	5489	100

* An individual referral may have more than 1 outcome; in 2006 there was 48% complete reporting on outcomes. This figure reflects only that 48%.

[†] This includes both completed and ongoing services.

[‡] Referrals were not completed due to client-related barriers including transportation, time constraints and other obligations, communication issues, eligibility and income issues, refusal of treatment, and/or lack of follow through.

[§] Referrals were not completed due to clients being placed on the waiting list or the provider was not accepting patients.

[¶] Economic support services include general support and program support through BadgerCare, Family Planning Medicaid Waiver, and Healthy Start.

^{**} Reproductive health services include contraceptive services (including emergency contraception), family planning, and general reproductive health services.

^{††} Dental services include routine cleaning, treatment of dental caries and other oral health needs satisfied by a dentist or dental hygienist.

^{‡‡} Prenatal care services include care coordination as well as medical services.

^{§§} Physician-provided services include referrals to primary care physicians and specialty care physicians.

identified information for the entire state, and use that information to track progress toward meeting the goals of the Wisconsin 2010 State Health Plan.² Therefore, SPHERE enables independent organizations to have power over their data, as well as allow assessment on the local, regional, and statewide level.

To demonstrate SPHERE's ability to measure systems change across multiple sectors at the statewide level, the following example focuses on the subset of services that record referrals and outcomes. Preliminary data on a subset of health services, benefits, and health-related funding provided to clients in 2006 is presented in Table 1. Selected referral outcomes include economic support services, reproductive health services, dental services, routine childhood immunization services, prenatal care services, and physician-provided services. The available data indicates that physicians have the larg-

est number of referral outcomes, and among physician-provided services, 86% of clients receive services for which they are referred. In addition, physicians have among the lowest percent of loss to follow up (2% of referral outcomes) and incomplete services due to provider barriers (1% of referral outcomes). Comparatively, dental referral outcomes appear to report the lowest percent of clients receiving services (44%), and a relatively high percent of loss to follow up (4%) as well as incomplete services due to client and provider barriers (36% and 16%, respectively). Economic support, reproductive health, routine childhood immunizations, and prenatal care all report a relatively high percent of clients receiving services, ranging from 75% to 85%.

As we assess progress towards achieving the 2010 State Health Plan Goals, calculating the relative risk (RR) is 1 way to identify systems-level issues that may war-

rant further attention, relative to other selected services (Table 2). Considering referred clients lost to follow up, above average risk is apparent among prenatal care services (RR=1.8) and dental services (RR=1.6). Conversely, below average risk is reported for physician-provided services (RR=0.7), and similar risk is reported for economic support, reproductive health, and immunizations (RR=0.9). Compared to other selected services, in 2006 the ability to receive dental services appears to be much lower than other selected services (RR=0.6). For incomplete services due to client-related barriers, the greatest relative risk reported is for dental services (RR=2.1) and prenatal care services (RR=1.1). Compared to dental services (RR=5.7), other selected health services appear to have relatively low risk of incomplete services due to provider barriers.

Although these results do not

Table 2. Relative Risk of Referral Outcome for Selected of Health Services, 2006*

Type of Health Service	Referral Outcome			
	Lost to Follow Up	Receiving Services	Incomplete Services, Client Barrier	Incomplete Services, Provider Barrier
Economic Support Services [†]	0.9	1.0	1.0	0.6
Reproductive Health Services [‡]	0.9	1.1	0.8	0.4
Dental Services [§]	1.6	0.6	2.1	5.7
Routine Childhood Immunization Services	0.9	1.1	0.6	0.8
Prenatal Care Services**	1.8	1.0	1.1	0.3
Physician-Provided Services ^{††}	0.7	1.1	0.7	0.2
Average Referrals and Outcomes	1.0	1.0	1.0	1.0

* Relative Risk is calculated using the average percent from Table 1, and does not take into account the distribution of non-response among the selected types of health service. This example is intended to demonstrate the ability of SPHERE to monitor quality and access across systems; 52% of referrals do not record any outcome.

[†] Economic support services include general support and program support through Badger Care, Family Planning Medicaid Waiver, and Healthy Start.

[‡] Reproductive health services include contraceptive services (including emergency contraception), family planning, and general reproductive health services.

[§] Dental services include routine cleaning, treatment of dental caries and other oral health needs satisfied by a dentist or dental hygienist.

** Prenatal care services include care coordination as well as medical services.

^{††} Physician-provided services include referrals to primary care physicians and specialty care physicians.

account for variations in outcome reporting for the health services, Table 2 demonstrates 1 approach to evaluate service delivery and measure relative progress toward achieving State Health Plan goals. This example demonstrates 1 potential application of SPHERE using a non-representative sample of referrals with outcomes.

Future of SPHERE

SPHERE is an example of a functioning electronic record system currently being used to improve reporting and transform Wisconsin's public health system to meet the demands of the 21st century. As the use of SPHERE grows, public health has continued to develop SPHERE reporting and training initiatives at the local, regional, and statewide level. One SPHERE project currently underway involves developing software that allows users to record data on handheld devices. Once fully implemented, this will allow SPHERE users to enter data in the field, even in the absence of on-line access. We are hopeful that the use of handheld devices will increase the efficiency

and completeness of reporting, and will constitute a step toward real-time data exchange.

Quantitative and qualitative assessment is a core function of public health that involves the systematic reporting, analysis, and dissemination of data. As we develop Wisconsin's electronic health capacity, it is important to acknowledge how SPHERE is used to document service delivery and measure quality. Building on the SPHERE framework may provide insight into how similar systems can be implemented. Moreover, the extent to which Wisconsin becomes a leader in eHealth will depend, in part, on the ability for public health data repositories such as SPHERE to share information with other sectors of health care and track clients through a continuum of services. The electronic exchange of data between health care professionals and the public health system is essential to responding at the point of care as well as to the needs of the community. SPHERE serves an important and distinct purpose for public health in Wisconsin, and as we continue to refine and expand the ca-

pabilities of this system, SPHERE will continue to be recognized as an important tool for supporting public health's core functions and achieving common public health goals.

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