

Use of Clinical Indicators to Evaluate COPC Projects

Nancy J. Baker, MD, Peter G. Harper, MD, MPH, and Christopher J. Reif, MD, MPH

Background: In 1989, Ramsey Family and Community Medicine Residency adopted a population-based focus for teaching and clinical activities based on the principles of community-oriented primary care (COPC). Evaluation and outcomes measurement proved problematic for each of the five COPC projects we implemented.

Methods: Surrogate measures, or key clinical indicators, were used to monitor the following COPC projects at Ramsey Family Physicians clinic: preschool immunization, family-centered birth, intimate interpersonal violence, teenage pregnancy-sexually transmitted disease prevention, and human immunodeficiency virus (HIV) screening.

Results: Between 1995 and 1998, we documented a decline in preschool immunization rates, an increase in preterm births and low-birth-weight infants, improved intimate interpersonal violence screening, a high but stable teenage pregnancy rate, a decrease in teenage chlamydia rate, and improved HIV prenatal screening. Our data collection and analysis were complicated by a lack of relevant indicators related to target goals, a shifting denominator, incomplete data and an unstable numerator, disconnected data sources, and missing comparison data.

Conclusions: COPC project evaluation is an evolving process, and measurement deficiencies become recognized with time. Even so, outcomes measurement legitimizes COPC interventions and provides a value-added component to resident education and clinical activities. (J Am Board Fam Pract 2002;15: 355–60.)

In 1989 the Ramsey Family and Community Medicine Residency adopted a population-based focus for teaching and clinical activities based on the principles of community-oriented primary care (COPC).¹ We selected five specific COPC projects for implementation at Ramsey Family Physicians (RFP) clinic. The five projects with each of their COPC component steps are summarized in Table 1. Also included in Table 1 are ideal outcome measures, surrogate measures we called clinical indicators, and actual RFP project outcome data that we published first as a 1995 RFP checkup report and later as a 1998 RFP report card.

Evaluation is an essential part of the COPC methods. Nutting² states that evaluation determines the extent to which COPC projects have a positive impact on a target health problem in the

community. Despite clear recognition that this fourth step provides legitimacy to COPC interventions, evaluation proved difficult for us, as it has been for other authors.^{3–5} Few studies describe in detail how to overcome difficulties that arise when working with outcome data outside a research setting. Despite the detailed description of several COPC demonstration projects by Rhyne et al,³ there is no description of site experience with the evaluation process or specific outcomes measurement. Helitzer et al⁴ suggest that cooperation with a community agency, a health authority, or an educational institution that can provide data analysis expertise might be necessary to accomplish the task. Deyo⁵ notes that the optimal timing or duration of follow-up for outcome assessments in many situations is unclear.

This article summarizes data issues other than those related to research, including five types of evaluation problems we encountered, as well as lessons learned from our efforts to assess the impact of our COPC projects.

Methods

The RFP preschool immunization project began in response to a 1990 measles epidemic in our com-

Submitted, revised, 19 February 2002.

From Ramsey Family and Community Medicine (NJB, PGH, CJR), HealthPartners Institute for Medical Education, Minneapolis, MN. Address reprint requests to Nancy J. Baker, MD, University Family Physicians, Smiley's Clinic, 2615 East Franklin Ave, Minneapolis, MN 55406.

Portions of the RFP Report Card data were presented by Drs. Baker and Reif at the annual meeting of the Society of Teachers of Family Medicine, 29 April–2 May 1999, Seattle, Wash, and by Dr. Baker at the North Central Regional STFM meeting, 1 October 1999, Rochester, Minn.

Table 1. Ramsey Family Physicians (RFP) Community-Oriented Primary Care Project Components.

Component	Preschool Immunizations	Family-Centered Birth	Intimate Interpersonal Violence	Teenage Pregnancy-STD Prevention	HIV Screening
Problem	1. Low immunization rates	1. High preterm labor and low-birth-weight risk, especially in women of color 2. Low breast-feeding rates	1. Undiagnosed intimate interpersonal violence	1. High teenage pregnancy rates 2. High teenage chlamydia rates	1. Undiagnosed HIV infection
Defined population	1. Preschoolers <24 mo	1. Women receiving prenatal care	1. Adult women	1. Female patients 11–19 y	1. Men and women at high risk for HIV
Intervention	1. Assess and vaccinate each visit 2. Provider education 3. Computer registry 4. Patient recall	1. Prenatal calendar 2. Provider education 3. Case coordinator and team care 4. On-site prenatal classes 5. Preterm labor screening 6. Breast-feeding support postpartum	1. Provider education 2. Nursing assessment protocol 3. On-site advocate 4. Special prenatal class	1. Provider education 2. Teenage screening form 3. Peer contact(s) 4. On-site condoms; birth control basket	1. HIV screening, pretest and posttest counseling protocol 2. Provider education 3. HIV added to prenatal screening laboratory tests
Ideal outcome	1. Up to date with 4 DTP, 3 polio, 1 MMR by 24 mo = 90% (Healthy People 2000 goal)	1. Preterm births <5% 2. Low-birth-weight babies <5% 3. Breast feeding ≥75% for 6 mo (Healthy People 2000 goals)	1. Decrease intimate interpersonal violence in the community	1. Female patients 11–19 y, pregnancy rate <50/1,000 2. Female patients 15–19 y, chlamydia rate <12.3/1,000 (Healthy People 2000 goals)	1. All at-risk persons tested for HIV infection (Minnesota Department of Health goal)
Surrogate measure(s)—RFP clinical indicators	1. RFP immunization rates at 24 mo	1. Preterm birth <37 wk, % 2. Low birth weight <2,500 g, % 3. Breast-feeding 2 wk postpartum, %	1. Prenatal patients screened for IPV, % 2. Women screened for IPV within 1 y, %	1. Female patients 11–19 y, pregnancy rate 2. Female patients 15–19 y, chlamydia rate	1. Prenatal patients screened for HIV, %
1995 RFP check-up report (issued 1997)	1. Up to date with 4 DTP, 3 polio, 1 MMR at 24 mo = 69%	1. Preterm = 6.1% 2. Low birth weight = 6.1% 3. Initiate breast-feeding = 57%	1. Prenatal patients screened for IPV based on billing data = 8.8% 2. Women ≥19 y screened for IPV based on billing data = 1.4%	1. Female patients 11–19 y, pregnancy rate = 144/1,000 2. Female patients 15–19 y, chlamydia rate = 51.9/1,000	1. Prenatal patients screened for HIV = 17%
1998 RFP report card (issued 1999)	1. Up to date with 4 DTP, 3 polio, 3 influenza (HIB), 3 hepatitis B at 24 mo = 64.6%	1. Preterm = 6.9% 2. Low birth weight = 8.2% 3. Breast-feeding at hospital discharge = 36%	1. Prenatal patients screened based on billing data = 22% 2. No data collected for women ≥19 y 3. Prenatal patients screened based on chart review = 83%	1. Female patients 11–19 y, pregnancy rate = 149/1,000 2. Female patients 15–19 y, chlamydia rate = 29/1,000	1. Prenatal patients screened for HIV = 67.1%

STD—sexually transmitted diseases, HIV—human immunodeficiency virus, IPV—interpersonal violence, DTP—diphtheria, tetanus, pertussis, MMR—measles, mumps, rubella, Hib—*Haemophilus influenzae* type b conjugate.

munity. Clinic interventions included a system to assess and vaccinate preschoolers at every office visit, a provider education initiative, development of a computerized immunization registry, and a patient recall system.

The family-centered birth project arose out of concern regarding the residents' obstetric training and the poor pregnancy outcomes in our community. RFP interventions included developing a protocol for care, called the prenatal calendar, enhancing team care with a case coordinator, providing on-site prenatal childbirth education classes, implementing a preterm labor-screening tool, and participating in efforts to provide enhanced breast-feeding support to new mothers in the hospital.

The third clinic project focused on intimate interpersonal violence and resulted from one resident's interest in the issue. He succeeded in forging a partnership with the St. Paul Intervention Project to End Domestic Abuse, the Ramsey County Health Department, and our clinic to address intimate interpersonal violence. COPC interventions included provider education, implementing a nursing assessment protocol for abuse, providing an on-site woman's advocate, and focusing on nonviolent parenting and safe, respectful intimate relationships as part of childbirth education classes taught at RFP.

The RFP teenage pregnancy-sexually transmitted disease (STD) prevention project emerged as the staff recognized that many of the prenatal patients seen at RFP were teenagers. Interventions included enhanced resident education, systematic screening of all clinic teens for high-risk behaviors, providing teens access to peer counseling, and improved on-site family-planning resources.

The fifth COPC project at RFP grew out of our growing concern about HIV infection and acquired immunodeficiency syndrome in the community. The clinic developed protocols and tools for HIV screening, provided resident and staff education on the topic, and integrated the project into the clinic's family-centered birth project and teenage pregnancy-STD prevention program.

The US Public Health Service provided us with ideal population health outcomes in the form of the *Healthy People 2000* goals.⁶ Although the goals were relevant to our five COPC projects, outcomes did not correlate in all areas. Thus, we defined surrogate measures, or key clinical indicators, to monitor each RFP COPC project (Table 1). Each indicator

needed to be (1) clinically meaningful, (2) easily measured, (3) relevant to other providers and health care planners, (4) comparable to data from other sources, and ideally, (5) connected to best evidence and practice initiative guidelines.

Results

In September 1997, we produced our first checkup report card summarizing clinical indicator data results for the COPC projects. The report was based on billing data from 1995. In addition to presenting preliminary information on the clinical indicators for each COPC project, the report provided an overview of the demographic characteristics of patients who received care at RFP.

Even as the first report card was being produced, we implemented electronic systems to improve the ease of collecting clinic data. Although chart audits for each project proved simple, they were time consuming and labor intensive. For the immunization project, a new computer software program enabled the staff to create an immunization registry for RFP. For the intimate interpersonal violence project, the billing encounter form was modified to include a surrogate code for denoting a positive or negative screening finding for domestic violence. For the teenage pregnancy-STD project, the clinic arranged for customized, monthly reports from the hospital information systems department that included demographic information and specific outpatient *International Classification of Diseases, Ninth Revision (ICD-9)* diagnosis codes. Finally, the hospital laboratory electronically downloaded information regarding diagnostic tests ordered for pregnancy confirmation and STDs.

With these changes, the second (1998) report card was produced in April 1999. It provided a year in review for RFP and included information on the five COPC project clinical indicator data sets, as well as information regarding several continuous quality improvement activities within the department. This second RFP report showed a decline in preschool immunization rates, an increase in preterm births and low-birth-weight infants, improved interpersonal violence screening, a high but stable teenage pregnancy rate, a decrease in teenage chlamydia rate, and improved HIV prenatal screening (Table 1).

Discussion

The 1995 checkup and 1998 RFP report card have played an important role in clinical care and resident education at Ramsey Family and Community Medicine. They highlight inherent problems that arise when working with intervention outcomes measurement. Specific problems that arose with our data collection and analysis include the following: (1) lack of relevant indicators related to target goals, (2) shifting denominator, (3) incomplete data or an unstable numerator, (4) disconnected data sources, and (5) missing comparison data (Table 2). Each issue, as well as lessons learned, is summarized below.

One of the most vexing data issues that arose with each COPC project was a lack of relevant clinical indicators related to target goals that could be measured easily at the clinic level. The *Healthy People 2000* goals were clear for preschool immunization rates, preterm labor, low-birth-weight outcomes, and breast-feeding rates at 6 months. Despite clear outcome target goals, however, we did not have access to data for many of the newborns at 6 months of age. As a result, we were unable to determine a 6-month breast-feeding rate. The most reliable data we could gather were the percentage of women breast-feeding when released from the hospital, which became our clinical indicator.

There is no accepted target goal or method for monitoring intimate interpersonal violence in the clinic and community at large. Ultimately, we chose to monitor a process measure of the percentage of women screened for interpersonal violence. Finally, for HIV screening, patients at risk are not easily recognized. To define our clinical indicator, we had to select a group known to have unprotected intercourse—our prenatal patients. In sum, we learned that we needed to select clinical indicators that are objective, measurable, and obtainable, even if they do not correlate to an ideal target goal. In addition, process measures might need to be substituted when outcome measures are not possible, as was the case with intimate interpersonal violence.

We also had difficulty with shifting denominators for each of the five COPC projects. For example, in the case of preschool immunizations, our denominator criteria differed between the two reports. In 1995, data were collected on all children younger than 2 years of age who had at least two visits to the RFP. For the 1998 report, the Minnesota Department of Health recommended we col-

lect data for all preschoolers who had only one visit since birth. The denominator also changed for women monitored in the family-centered birth project. For the 1995 report, we looked at only those women who received prenatal care at RFP and were attended by family practice faculty. In the 1998 report, we included in our analysis women who were referred to an obstetrician-gynecologist or gave birth by cesarean section. These experiences taught us that even well-thought-out denominator definitions can be vague or imprecise and are not necessarily agreed on by all groups. In addition, sometimes these deficiencies are recognized only after some time has elapsed.

Our third data issue relates to incomplete data or an unstable numerator. In an urban setting, vaccines might be administered elsewhere, and data would be unavailable for inclusion in our up-to-date statistics. *Haemophilus influenzae* type b and hepatitis B were considered part of the primary immunization series in 1998, but not 1995. For the interpersonal violence project, the numerator was dependent on accurate provider documentation of screening results. Providers acknowledged they often did not document this information in the medical record. Our numerator data are also incomplete regarding STDs and pregnancy in teenagers because they go to a variety of settings for testing. Likewise, at the beginning of our HIV work, many at-risk men and women chose not to get testing at RFP, preferring anonymity at the Minnesota Department of Health. Thus, not only did we have incomplete data, we needed to change the numerator definition to include those counseled to get HIV testing as well.

Overall, we learned that one clinic's experience does not tell the whole story, because patients have access to other facilities where similar clinical services are provided. In addition, if the numerator criteria change, it is important to overlap data sets by at least 1 year so that they can be compared with one another. Cost of time needed or money allocated can then become an important issue for overall COPC project evaluation.

Disconnected data sources represent the fourth evaluation difficulty we encountered. Chart reviews remain an essential part of the COPC evaluation process. Chart reviews are, however, time and labor intensive work. Thus, with each of our five COPC projects we tried to develop an electronic database for ease of data collection, review, and reporting.

Table 2. Ramsey Family Physicians (RFP) Community-Oriented Primary Care Data Issues.

Data Issues	Preschool Immunizations	Family-Centered Birth	Intimate, Interpersonal Violence	Teenage Pregnancy, STD Prevention	HIV Screening	Lesson(s) Learned
Lack of relevant clinical indicators related to target goals	<ol style="list-style-type: none"> 1. <i>Healthy People 2000</i> goals 	<ol style="list-style-type: none"> 1. <i>Healthy People 2000</i> goals 	<ol style="list-style-type: none"> 1. No accepted target goal(s) for clinic and community 	<ol style="list-style-type: none"> 1. <i>Healthy People 2000</i> goals 	<ol style="list-style-type: none"> 1. No accepted target goal(s) 	<ol style="list-style-type: none"> 1. Choose objective, measurable, and obtainable indicators 2. Consider process measures
Shifting denominator	<ol style="list-style-type: none"> 1. RFP active patient definition changed from 2 or more visits initially to Minn. Dept. of Health recommendation of even those with only 1 visit 	<ol style="list-style-type: none"> 1. First report looked at women who received prenatal care at RFP and delivered by family physician; second included those transferred or delivered by cesarean section 	<ol style="list-style-type: none"> 1. Initial denominator of all adult women seen at RFP impractical; later, subsets of teenagers and pregnant patients used 	<ol style="list-style-type: none"> 1. Lower age limit differs: Minn. Dept. of Health and <i>Healthy People 2000</i>—patients aged 11 y; others use 12 y or 14 y; new Minn. Dept. of Health data includes patients aged 10 y 	<ol style="list-style-type: none"> 1. Initial group had high risk of HIV; intravenous drug use, gay or bisexual patients or history of multiple sex partners; later focus was prenatal patients 	<ol style="list-style-type: none"> 1. Denominator definitions might not be well defined or agreed upon by other groups 2. Deficiencies recognized with time
Incomplete data or unstable numerator	<ol style="list-style-type: none"> 1. In urban areas, vaccines administered elsewhere 2. Minn. Dept. of Health added hepatitis B and influenza (HIB) to primary series 	<ol style="list-style-type: none"> 1. Patients transferred care before delivery 2. Could find data only on breast-feeding at hospital discharge, rather than at 2-wk or 6-mo endpoints 	<ol style="list-style-type: none"> 1. Dependent on provider documentation 	<ol style="list-style-type: none"> 1. Teenagers go elsewhere for STD and pregnancy tests 	<ol style="list-style-type: none"> 1. Some went elsewhere for testing; needed to include those counseled to get HIV test 2. Prenatal subset well defined 	<ol style="list-style-type: none"> 1. One clinic's experience does not tell whole story 2. If numerator changes, overlap data years
Disconnected data sources (chart review vs electronic data base)	<ol style="list-style-type: none"> 1. Computer registry did not work—not networked with other clinics 2. Technical problems necessitated ongoing chart review 	<ol style="list-style-type: none"> 1. Chart review satisfactory because of well-defined, modest-sized subgroup 	<ol style="list-style-type: none"> 1. Electronic surrogate marker on billing sheet ineffective; chart review essential 	<ol style="list-style-type: none"> 1. Unable to link age, name, and laboratory results in single electronic search; cross-reference necessary 	<ol style="list-style-type: none"> 1. Needed to work backwards; began with laboratory data, which guided retrospective chart review 	<ol style="list-style-type: none"> 1. Chart review labor intense, dependent on documentation 2. Pros and cons to each source 3. Most clinics need both; electronic sources not mature
Missing comparisons	<ol style="list-style-type: none"> 1. No clinic-based data available 2. Time lag for population-based data 	<ol style="list-style-type: none"> 1. No clinic-based data available 2. Time lag for population-based data 	<ol style="list-style-type: none"> 1. No clinic-based data available 2. We were the first to gather this data in our community 	<ol style="list-style-type: none"> 1. No clinic-based data available: statewide population 2. Time lag for population data 	<ol style="list-style-type: none"> 1. No published data 	<ol style="list-style-type: none"> 1. Urban clinic populations might not be comparable with available data sources

STD—sexually transmitted disease, HIV—human immunodeficiency virus, Minn. Dept. of Health—Minnesota Department of Health, HIB—*Haemophilus influenzae* type b conjugate.

The surrogate billing code used to denote screening for intimate interpersonal violence, however, proved ineffective. Providers simply failed to code the intervention. In our teen project, we were unable to link age, name, and laboratory results in a single electronic search. Our laboratory and billing systems were mutually exclusive and needed to be cross-referenced. There were also problems with our efforts to create a computerized immunization registry and with our inability to connect positive STD results electronically with HIV screening. Because most electronic systems are designed primarily for billing purposes, they are not yet mature enough to gather relevant population health data. Data gathered from chart review, however, will always depend on the accuracy of provider documentation. In sum, there are advantages and disadvantages to both electronic data sources and chart reviews to gather clinical data. Most clinics need both to accomplish this work successfully.

Finally, there was a relative lack of comparison data for each of the RFP COPC projects. We were unable to locate any clinic-based data for preschool immunization rates, birth outcomes, breast-feeding rates, interpersonal violence screening, teenage pregnancy, and chlamydia or HIV screening rates. For example, our rates for teenage pregnancy and STDs have as the denominator all teens who visited the clinic within the last year. Because teens who come to clinic are more likely to be at risk for pregnancy and a STD, we cannot make a meaningful comparison to rates that use the general population as the denominator for a teenage pregnancy rate. There is also a considerable time lag for population-based data in these project areas. For example, the best county and state public health data for teenage pregnancy and chlamydia rates located for the 1998 report were from 1996. The lesson we learned from this data issue is that urban clinic population data might not be comparable to readily available data sources.

Conclusion

Our experience with defining markers, gathering outcomes data, and producing a clinic report card has helped us orient our primary care at RFP to the community where we teach and practice. Measurement lessons learned from producing the clinic report cards assist us in our continued efforts to monitor the health of our community.

We have learned that evaluation has a maturation timeline, and deficiencies become recognized

with time. It is essential that details about definitions, data collection, interpretation, and analysis be noted so we can be consistent with future comparisons. COPC project evaluation is an evolving process. Our efforts appear to have improved with time as we learned how to work with the data.

Despite a lack of relevant clinical indicators related to target goals, shifting denominators, incomplete data and unstable numerators, disconnected data sources, and missing comparisons, our report card data have been invaluable in our resident teaching activities. These five COPC projects, designed to improve population health, provide a value-added component to resident education and clinic activities at RFP. Not only do residents learn to care for individual patients, they gain experience with a modest database containing information on target populations who are members of their practice community. This database, in turn, helps us evaluate the overall effectiveness of our COPC interventions within the clinic.

The authors wish to express their appreciation to the staff and resident physicians at RFP for their enthusiasm in implementing the various COPC projects. A special word of thanks to Rebekah Tempest, Ann Gonzalez, Amy Cochrane, and Kim Stone for providing technical assistance with many aspects of this work, as well as for their commitment to community medicine and medical education.

References

1. Nutting PA. Population-based family practice: the next challenge of primary care. *J Fam Pract* 1987;24:83–8.
2. Nutting PA. The evaluation function in COPC: quality assurance for the community. In Nutting PA, editor. *Community-oriented primary care: from principle to practice*. Washington DC: DHHS, Public Health Service, Health Resources and Services Administration, Office of Primary Care Studies, 1987. [HRSA publication No. HRS-A-PE 86-1.]
3. Rhyne R, Bogue R, Kukulka G, editors. *Community-oriented primary care: health care for the 21st century*. Washington, DC: American Public Health Association, 1998.
4. Helitzer D, Rhyne R, Skipper B, Kastelic L. Evaluating your intervention. In: Rhyne R, Bogue R, Kukulka G, editors. *Community-oriented primary care: health care for the 21st century*. Washington, DC: American Public Health Association, 1998:175–203.
5. Deyo RA. Using outcomes to improve quality of research and quality of care. *J Am Board Fam Pract* 1998;11:465–73.
6. *Healthy people 2000: national health promotion and disease prevention objectives*. Washington, DC: DHHS, Public Health Service, Office of Disease Prevention and Health Promotion, 1991.