The Effect of Dedicated Breast Surgeons on the Short-Term Outcomes in Breast Cancer

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Objective: The impact of breast surgeons on short-term outcomes in breast cancer care was compared at a single institution.

Summary Background Data: Many studies have demonstrated a correlation between high procedural volume and lower mortality in technically challenging procedures. Breast cancer treatment has significant impact on patient behavior, psychology, and appearance. Therefore, evaluation of outcomes cannot be limited to only operative mortality and morbidity. We sought to determine the effect of dedicated breast cancer surgeons on short-term outcomes at a single institution.

Methods: Wishard Memorial Hospital is the county hospital affiliated with the Indiana University School of Medicine. A retrospective review was performed of all patients from January 1, 1997, to February 28, 2006. On July 1, 2003, coverage for the Breast Clinic was changed from general surgeons (G) to breast surgeons (B). There were 596 patients included in the study period.

Results: There were no significant differences in patient demographics or disease characteristics between the 2 time periods. For early stage (stage I and II) breast cancer, a higher percentage of patients underwent breast conservation in the breast surgeon period than in the general surgeon period ($P = 0.04$). Lumpectomy margins in breast conserving operations during the G period were more often positive ($P = 0.025$) or close (<1 mm) ($P = 0.01$). Similarly, the rates of re-excision lumpectomy were also significantly lower during the B period (21% vs. 39%, respectively, $P = 0.01$). Breast surgeons were more likely to perform the sentinel node procedure ($P = 0.001$). There were no differences in the use of adjuvant chemotherapy and radiation therapy. The use of hormonal manipulation, however, was significantly higher in the B group than in the G group ($P < 0.0002$).

Conclusions: Surgeons specialized in diseases of the breast demonstrate significant improvement in short-term outcomes associated with breast cancer treatment at a single institution. The differences identified cannot be attributed to differences in institutional function, patient population, surgeon case volume, or on the influence of nonsurgeon physicians.

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Many studies have demonstrated a correlation between high procedural volume and improved surgical outcomes. The majority of these studies have focused on technically challenging procedures such as pancreaticoduodenectomy and coronary artery bypass graft, which have the inherent risks of significant morbidity and mortality.[1–3] Significant discrepancy can be found in mortality rates between high-volume and low-volume hospitals and in mortality rates for surgeons who perform the procedure on a regular basis compared with those who perform the procedure only infrequently.[2–5]

In breast cancer surgery, the risk of perioperative morbidity or mortality should be minimal regardless of the surgeon performing the procedure. Cancers with lower perioperative risks, however, often have much higher incidence compared with cancers requiring a more technically challenging surgical procedure.[6] In breast cancer, with its long history of patient advocacy and the significant impact of the operation on patient behavior, psychology, and appearance, evaluation of outcomes cannot be limited to operative mortality or morbidity.[7–9]

Although hospital or medical center wide volume and individual surgeon case volume both have been found to correlate with improved outcomes in breast cancer,[10,11] less data exist on the differences in surgical outcomes when comparing surgeons specializing in breast surgery compared with the general surgeon who must attempt to master many areas of Surgery. Gillis and Hole[12] used the West of Scotland Cancer Registry to demonstrate an improvement in breast cancer survival when patients were treated by specialists compared with nonspecialist surgeons. They later demonstrated that this difference remained in the era of breast cancer screening[13] and showed that a higher proportion of adequate local treatment by specialists results in lower local recurrence rates both in the breast and in the axilla.[14]

Skinner et al looked at 29,666 patients who underwent surgery and showed that breast surgical specialists achieved a 33% reduction in the risk of death compared with nonspecialists ($P < 0.001$). Dr. Skinner hypothesized that specific training and knowledge of breast cancer had a greater influence on these outcomes rather than experience from high case volumes.[15]

The surgical management of breast cancer is the model of multidisciplinary care as extensive knowledge of other fields of medicine and the proper interaction of these different

specialties is necessary to provide optimal patient care. Most cancer centers have regular conferences with interaction of medical oncologists, pathologists, radiologists, radiation oncologists, and surgical oncologists to facilitate care of complicated cases. The specialization of the breast surgical oncologists allows the surgeon to become an expert in breast-cancer–related procedures, maintain knowledge of the voluminous and quickly changing literature, and to more fully educate the patients to thereby assist them in the decision-making process.[16] We sought to determine the effect of dedicated breast cancer surgeons on short-term outcomes at a single institution over an 8-year period.

METHODS

Patients

Wishard Memorial Hospital is the city-county hospital affiliated with the Indiana University School of Medicine in Indianapolis, Indiana. In 1997 the National Center of Excellence for Women's Health was established at Wishard Memorial Hospital. The Center of Excellence (CoE) was established from funds from a variety of sources. The Office of Women's Health at the United States Department of Health and Human Services provided part of the funding and thus "National" is included in the name of the center.[17] There are 20 National CoEs at academic medical centers. The CoE at Wishard Memorial Hospital is one of only 2 or 3 which is based in a public safety net hospital. Although the CoE is to serve any or all women with whom they come into contact, most are indigent or underinsured. Various clinics related to the health of women, including a clinic for benign and malignant diseases of the breast, were created.

Underinsured patients were considered to be all those patients without commercial insurance or health maintenance organization coverage. In the State of Indiana, these patients are covered by Medicare, Medicaid, and Wishard Advantage. Self-pay or charity care patients were also included in the underinsured patient population. Wishard Advantage is a class of insurance funded by taxes from Marion County (metropolitan Indianapolis), Indiana, to help provide coverage for those patients with limited financial resources who do not qualify for Medicare or Medicaid.

Institutional review board approval was obtained before the start of the study. A retrospective review was performed of all patients seen at Wishard Memorial Hospital for care of their primary breast cancer from January 1, 1997, to February 28, 2006. The patients were identified by the Regenstrief Medical Records System (www.regenstrief.org, Indianapolis, IN). The patients were identified by having "breast cancer" as a diagnosis or having the ICD9 code 174.x. An initial 2022 patients were identified. All patients having their primary operation before January 1, 1997, were excluded. For patients who did not undergo an operation, those who had their initial visit before January 1, 1997, were excluded. In addition, all patients having their primary operation at an outside institution were excluded. Other exclusion criteria included all male patients, and all patients with a new breast primary or recurrence who had the first primary breast cancer before January 1, 1997. After exclusions, a total of 596 patients comprised the study population.

Surgeons

On July 1, 2003, coverage for the Breast Clinic of the CoE at Wishard Memorial Hospital was changed from general surgeons to breast surgeons. Before July 1, 2003, 6 general surgeons performed the breast operations. These surgeons did all general surgery operations and procedures including trauma and critical care. The 6 surgeons had been in practice for an average of 18.3 years since completing training. After July 1, 2003, 3 breast surgeons who do exclusively breast operations and are specialized in diseases of the breast did all but 2 of the operations. The 3 breast surgeons have been in practice for an average of 18.3 years. One of the 3 breast surgeons completed a breast fellowship and completed training after 2000.

Statistical Considerations

Short-term outcomes of breast cancer care were evaluated in the study population. Each outcome based on the time period before and after the change to exclusively breast surgeons (July 1, 2003) were studied. The Fisher exact test and the χ^2 test were used to determine differences between the 2 time periods. Unpaired t test was used to compare medians and means of the 2 time periods.

RESULTS

Patient Characteristics

There were 596 patients included in the study period, 389 between January 1, 1997, to June 30, 2003 (G period) and 207 from July 1, 2003 to February 28, 2006 (B period). Demographic information is shown in Table 1. There were no significant differences in demographics between the 2 time periods. Most patients were between 50 and 59 years of age, African American, postmenopausal, unemployed, and covered under Medicaid. In the latter time period, a larger proportion of patients who did not qualify for Medicaid were covered under Wishard Advantage rather than remaining uninsured and falling into the self-pay category. Most patients in both groups had not had a screening mammogram within 2 years of presentation, and this percentage was stable over both time periods.

Disease Characteristics

There was no difference in the disease characteristics in the 2 groups (Table 2). Most patients presented in clinical stage I or II. Of those patients undergoing primary systemic therapy, 8 had a pathologic complete response before June 30, 2003, whereas 6 had a pathologic complete response after July 1, 2003. Before June 30, 2003, estrogen receptor, progesterone receptor, and Her2/neu assays were less likely to be performed. When tested a similar proportion of patients expressed hormone receptors. In those tested, however, patients were more likely to have overexpression of Her2/neu in the G period but this difference was not statistically significant ($P = 0.08$).

TABLE 1. Patient Demographics

	January 1, 1997–June 30, 2003 (N = 389)	After July 1, 2003 (N = 207)	P
Age at diagnosis (median, mean)	56, 56.4	56, 57.7	NS
Less than 40	54 (13.9%)	18 (8.7%)	NS
40–49	72 (18.5%)	41 (19.8%)	
50–59	98 (25.2%)	61 (29.5%)	
60–69	97 (24.9%)	48 (23.2%)	
70 and more	68 (17.5%)	39 (18.8%)	
Race			NS
White	177 (45.5%)	82 (39.6%)	
African American	202 (51.9%)	113 (54.6%)	
Latin American	8 (2.1%)	10 (4.8%)	
Other	2 (0.5%)	2 (1.0%)	
Menopause			NS
Premenopausal	89 (22.9%)	46 (22.2%)	
Postmenopausal	260 (66.8%)	142 (68.6%)	
Perimenopausal/unknown	40 (10.3%)	19 (9.2%)	
Education			NS
Less than high school	121 (49.0%)	82 (48.5%)	
High school graduate	88 (35.6%)	59 (34.9%)	
Some college	38 (15.3%)	28 (16.6%)	
Unknown	142	38	
Employment			NS
Employed	69 (17.7%)	45 (21.7%)	
Unemployed	197 (50.6%)	102 (49.3%)	
Retired	107 (27.5%)	59 (28.5%)	
Disabled/unknown	16 (4.1%)	1 (0.5%)	
Insurance			NS
Commercial	60 (15.4%)	35 (16.9%)	
Medicare outpatient			
2nd: Medicaid/Wishard	124 (31.9%)	68 (32.8%)	
2nd: None	39 (10.0%)	8 (3.9%)	
Medicaid	63 (16.2%)	30 (14.5%)	
Less than Medicaid			
Wishard advantage	53 (13.6%)	54 (26.1%)	
None	50 (12.9%)	12 (5.8%)	
Screening mammogram within 2 yr of presentation			NS
Yes	159 (45.8%)	91 (47.9%)	
No	188 (54.2%)	99 (52.1%)	
Not indicated based on age	42	17	
Median height (N = 170, 156)	1.63 (5′4)	1.61 (5′3)	0.01
Median weight (N = 323, 199)	79.1 (174#)	81.4 (179#)	NS
Median BMI (N = 157, 154)	31.2	32.7	NS

BMI indicates body mass index (kg/m^2).

TABLE 2. Disease Characteristics

	January 1, 1997–June 30, 2003 (N = 389)	After July 1, 2003 (N = 207)	P
Stage at presentation			NS
0	63 (16.2%)	43 (20.8%)	
I	142 (36.5%)	66 (31.9%)	
II	91 (23.4%)	52 (25.1%)	
III	72 (18.5%)	31 (15.0%)	
IV	21 (5.4%)	15 (7.2%)	
Histology			NS
Invasive ductal	243 (87.1%)	120 (89.6%)	
Invasive lobular	35 (12.5%)	12 (8.9%)	
Other	1	2	
Pathologic stage			NS
0/pCR	72 (20.6%)	53 (29.4%)	
I	141 (40.4%)	67 (37.2%)	
II	90 (25.8%)	37 (20.6%)	
III	46 (13.2%)	21 (11.7%)	
IV	0	2 (1.1%)	
No operation	39	25	
Estrogen receptor			NS
Positive	201 (62.3%)	120 (64.9%)	
Negative	122 (37.7%)	65 (35.1%)	
Unknown	66	22	
Progesterone receptor			NS
Positive	74 (46.0%)	80 (53.3%)	
Negative	87 (54.0%)	70 (46.7%)	
Unknown	228	57	
Her2/neu (IHC 3+ or FISH+)			NS
Yes	56 (39.4%)	42 (29.4%)	
No	86 (60.6%)	101 (70.6%)	
Unknown	247	64	

IHC indicates immunohistochemistry; FISH, fluorescence in situ hybridization.

Management

In Table 3, there was no significant difference in the method of diagnosis when comparing preoperative needle biopsy to operative excisional biopsy. Before July 2003, however, fine needle aspiration was used more in place of core needle biopsy ($P = 0.002$).

The median time from diagnosis to operation was over 5 weeks in both groups (P = NS). The choice of operation was similar for ductal carcinoma in situ (DCIS) patients in both time periods. Approximately 80% of patients had a breast conserving operation rather than a mastectomy for DCIS. For early stage (I and II) breast cancer, a higher percentage of patients underwent mastectomy in the G period than in the B period ($P = 0.04$). In stage II patients, breast surgeons performed breast conserving operations in nearly 60% of patients whereas general surgeons did the opposite, performing a mastectomy in 60% of patients.

Lumpectomy margins in breast conserving operations during the G period were more often positive ($P = 0.025$) or close (<1 mm) ($P = 0.01$) than in the B period. Similarly, the rates of re-excision lumpectomy were more common in the G period (39% vs. 21%, respectively, $P = 0.01$). The average volume of tissue removed in the lumpectomy specimens was 175 cm^3 in the G period compared with 155 cm^3 in the B period, but this difference was not statistically significant ($P = 0.2$). The sentinel node procedure was introduced at our

TABLE 3. Surgical Management

	January 1, 1997–June 30, 2003 (N = 389)	After July 1, 2003 (N = 207)	*P*
Method of diagnosis			NS
Needle biopsy	342 (87.8%)	192 (92.8%)	0.002
Fine needle aspiration	166 (42.6%)	66 (31.9%)	
Core needle biopsy	176 (45.2%)	126 (60.9%)	
Excisional biopsy	40 (10.3%)	14 (6.8%)	
Other	7	1	
Median time to operation			NS
No neoadjuvant therapy	39 (SD 43)	36 (SD 36)	
Range (d)	(6–474)	(7–222)	
Operation for DCIS			NS
Breast conservation	50 (79.4%)	38 (80.9%)	
Mastectomy	13 (20.6%)	9 (19.1%)	
Operation for stage I/II			0.04
Breast conservation	134 (58.0%)	77 (69.4%)	
Mastectomy	97 (42.0%)	34 (30.6%)	
Lumpectomy margins			
Positive	33 (16.5%)	8 (6.7%)	0.025
Close (<1 mm)	53 (26.5%)	16 (13.9%)	0.01
Total	86 (43%)	24 (20.6%)	0.001
Re-excision lumpectomy	79 (39.5%)	25 (21.6%)	0.01
Sentinel node procedure			
Breast conservation	32/58 = 55%	59/61 = 97%	0.05
Mastectomy	1/35 = 3%	29/37 = 78%	0.001
All patients	33/93 = 35%	88/98 = 90%	0.001
Reconstruction after mastectomy	37/127 = 29%	16/55 = 29%	NS
Contralateral prophylactic mastectomy	1/166 = 0.6%	1/72 = 1%	NS
No operation	39/389 = 10.0%	25/207 = 12.1%	NS

TABLE 4. Adjuvant Therapy

	January 1, 1997–June 30, 2003 (N = 389)	After July 1, 2003 (N = 207)	*P*
Primary systemic therapy	109 (28.0%)	55 (26.6%)	NS
Chemotherapy	100 (25.9%)	40 (19.3%)	
Hormonal therapy	9 (2.3%)	15 (7.2%)	
Radiation therapy			NS
Yes	183 (75%)	102 (82%)	
No	60 (25%)	22 (18%)	
Unknown	11	3	
After breast conservation			
Yes	144 (82%)	84 (84%)	
No	31 (18%)	16 (16%)	
Unknown	9	3	
Postmastectomy			
Yes	39 (57%)	18 (75%)	
No	29 (43%)	6 (25%)	
Unknown	2	0	
Chemotherapy			NS
Yes	155 (78%)	65 (70%)	
No	45 (22%)	28 (30%)	
Hormonal manipulation			0.0002
Yes	125 (59%)	88 (80%)	
No	86 (41%)	22 (20%)	
Unknown	6	0	
DCIS			0.002
Yes	7 (18%)	14 (45%)	
No	32 (82%)	17 (55%)	
Unknown	1	0	
Invasive cancer			0.0001
Yes	118 (69%)	74 (94%)	
No	54 (31%)	5 (6%)	
Unknown	5	0	

institutions in 1998. In 2000, the sentinel node procedure was considered standard practice at our institutions. In patients without contraindication to sentinel node procedure, breast surgeons were significantly more likely to perform the sentinel node procedure as compared with the axillary lymph node dissection as the primary lymph node assessment operation. This difference was particularly striking in patients undergoing a mastectomy where 78% of patients underwent the sentinel node procedure in the B period, compared with only 3% in the G period.

The percentage of patients undergoing reconstruction after mastectomy was identical in both groups. In addition, during both time periods patients were equally unlikely to undergo a contralateral prophylactic mastectomy. A significant number of patients chose not to undergo an operation in both time periods (10% and 12%, P = NS).

Data regarding adjuvant therapy are shown in Table 4. There were no statistically significant differences in the use of neoadjuvant systemic therapy and adjuvant chemotherapy between the 2 time periods. The overall use of radiation therapy was similar in both groups. The use of postmastectomy radiation, however, was higher in the B group compared with the G group but this difference was not statistically significant. The use of hormonal manipulation was significantly higher in the B group than in the G group (P = 0.0002). These differences were evident both in the DCIS/chemoprevention setting and in the invasive cancer/hormone therapy group (P = 0.002 and 0.0001, respectively).

DISCUSSION

Our data demonstrate improvement in short-term outcomes associated with breast cancer treatment by surgeons specializing in breast surgery as compared with general surgeons at a single institution. The nonsurgeon physicians, the medical oncologists, pathologists, radiologists, and radiation oncologists have remained unchanged and are, therefore, a constant in our study. In addition, the demographics of the patient population remained constant over the time periods studied. Therefore, the differences identified cannot be attributed to differences in institutional function, patient population, or on the influence of nonsurgeon physicians. These differences also cannot be attributed to surgeon volume. In the G period, the cancer operations were done by 6 surgeons. In the B period, the cancer operations were done by 3 surgeons. There was no significant difference in average case

load per surgeon (58 vs. 60, respectively). The volume of breast cancer cases per year, however, did increase during the B period. In the G period, there were 60 breast cancer cases per year, compared with 80 breast cancer cases per year in the B period.

The change to breast surgeons made the largest impact on surgery-related short-term outcomes. In comparison with more complicated procedures, a lumpectomy is not a complex surgical procedure. It would, therefore, be expected that the rates of positive margins and re-excisions should not vary with similar patients at the same institution. Significant differences, however, occurred in exactly these areas: the rate of positive (transected) margins, close margins (margins <1 mm), and the rate of re-excision lumpectomy (Table 3). In all 3 categories, breast surgeons had rates nearly half that of the general surgeons. Lumpectomy volume cannot explain this difference, as breast surgeons had a smaller average volume of excision (155 vs. 175 cm^3), but this difference was not statistically significant. Clinically, this difference amounts to an additional 8 mm in one dimension of a 5×5-cm^2 specimen (ie, 6.2 cm vs. 7 cm). The 39.5% re-excision lumpectomy rate accomplished by the general surgeons at our institution is at the low end of previously reported data.[18–21] Therefore, the differences cannot be due to general surgeons lacking experience in breast cancer operations. The significant improvement in the rate of re-excision lumpectomy decreases the number of patients requiring repeat operations. This is very important to the breast cancer patient where anxiety and stress is greatly increased by the need for a second operation. In addition, patients who undergo re-excision lumpectomy have a poorer cosmetic outcome compared with patients who undergo a single breast conserving operation.[22,23] Although our data are too recent to allow comparison of long-term outcomes such as local recurrence rates or disease-free survival, margin status impacts these parameters. The findings of Kingsmore et al support our data as the rates of inadequate treatment of the breast were significantly different between specialist breast surgeons and nonspecialist surgeons (24% vs. 47%, respectively)[14] In this study, these differences translated to a 50% improvement in recurrence rates and a 20% lower risk of death from breast cancer.

Although still currently under investigation in 2 national prospective randomized studies, significant data support the use of the sentinel node biopsy (SNB) procedure and has been widely accepted as standard practice.[24–26] The use of the sentinel node procedure was significantly higher during the B period with 90% of patients undergoing the SNB compared with 35% during the G period. Although this could be because of the slower acceptance of the SNB as a standard of care approach to axillary staging in the earlier time period (G), the use of the sentinel node procedure did not change significantly by year during the G period. Therefore, the difference in the use of the procedure cannot be attributed to a lack of familiarity or experience with the technique. The use of the SNB also varied according to the type of breast surgical procedure. In those patients who underwent a mastectomy, 3% of patients during the G period underwent an SNB compared with 78% of patients during the B period.

Presently, the preferred treatment for noninvasive (DCIS) and early stage (stages I and II) invasive breast cancer is a breast conserving operation followed by radiation therapy.[27] For early stage invasive cancers, there was a significantly higher rate of breast conserving procedures during the B period. The similar patient population and demographic characteristics, in particular level of education, body mass index, and insurance coverage, suggest that patient-related factors were constant in our study. This suggests that the surgeon choice or patient education by the surgeon may be at least partially responsible for the higher rates of breast-conserving operations. In agreement with our results, Chagpar et al found that surgeons with a high percentage of breast practice and surgeons affiliated with academic institutions performed breast conserving operations more often than mastectomy for early stage cancer.[28] In DCIS patients, however, the rate of breast conserving procedures was nearly the same.

In patients not undergoing primary systemic therapy, the median time to operation was over 36 days and similar in both time periods. It may have been hypothesized that breast surgeons would have a shorter time to operation as general surgeons have a greater variety of cases and more cases requiring urgent and emergent operation. Our data did not support this presumption. Therefore, institutional limitations rather than the surgeon's practice had a greater effect on the ability of the surgeon to get the patient to the operating room in a timely fashion.

The differences in nonsurgical short-term outcomes related to breast cancer were not as great. Our data showed no significant difference in the rates of neoadjuvant systemic therapy, adjuvant chemotherapy, and overall use of radiation therapy. The use of radiation therapy after mastectomy was higher in the B period (75% vs. 57%); however, this difference was not statistically significant. The strongest evidence of the benefit of postmastectomy radiation came from the Danish studies DBCG 82b and 82c.[29,30] The increased use of postmastectomy radiation may be related to progressive dissemination of this data. The lack of significant differences in the use of adjuvant chemotherapy and radiation therapy indicates that other factors such as the consultation with the Medical oncologists and Radiation oncologists have more impact on patient decision making than the surgeon.

The one area of adjuvant therapy where significant differences between the 2 time periods were noted was in the use of hormonal manipulation ($P = 0.0002$). In the B period, patients were significantly more likely to take antiestrogen therapy for chemoprevention for DCIS (45% vs. 18%, $P = 0.002$). The use of Tamoxifen after operation for DCIS was established after the reporting of the NSABP B24 trial.[31] Only patients seen after this trial was reported were considered in the evaluation of this use of hormones. In addition, patients were more likely to use hormonal therapy in invasive cancers (94% vs. 69%, $P = 0.0001$). This difference may reflect improved patient education and continued education of the breast surgeon in the field of oncology.

The strength of this study is that short-term outcomes were analyzed under the influence of changing one factor, the specialization of the surgeon. All other variables were con-

stant: surgeon breast-case volume, patient population, institution, and other nonsurgeon physicians involved in the care of breast cancer patients. This was a unique situation that allowed such comparisons and ensured that the cases are comparable. The relatively small size of the study population (N = 596) and the small number of surgeons limits the statistical strength of the data. The recent time period is both a strength and a limitation. Indications for and use of adjuvant therapy are continually changing in breast cancer. Studies that use data that is even 10-years old often involve indications for and regimens of adjuvant therapy that today are considered outdated. The use of this recent time period and the necessity to compare sequential groups of patients, however, limits the overall follow-up and ability to compare long-term outcomes.

The results from our institution support the data of other studies regarding the effectiveness of subspecialty surgeons. The improved outcomes may be attributed to specialized surgical experience and training, continuing education, and dedicated interest to treating a specific disease.

Given its high incidence and long history of patient advocacy, breast cancer has generated the most concern about the quality of its care. There are many outcomes in breast cancer beyond overall survival. At our institution, dedicated breast surgeons improved surgical outcomes related to margin status, reoperation rates, and increased the use of breast conserving operations and the sentinel node procedure. The lack of improvement in the use of adjuvant chemotherapy and radiation therapy despite an improvement in the use of hormone manipulation indicates that continued focus on patient education is particularly important especially in an underinsured, indigent population.

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