Children with Congenital Heart Disease Served in Regional Centers, 1952-56

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REGIONAL centers for evaluation and treatment of congenital heart disease in children were initiated by the Children's Bureau at a time when such care was available in few States. The regional centers were planned to augment services under State crippled children's programs.

Though relatively small in total numbers, one of the most rapidly growing services to crippled children is the congenital heart disease program. The number of children receiving physicians' service in 1957 was almost five times the number in 1950, increasing from 2,207 to 10,168 (fig. 1). In 1958, 12,164 children with congenital malformations of the circulatory system were served. Why has this happened?

In 1939, Congress increased the appropriation for crippled children's programs with the understanding that part of these funds would be used by the States to develop services for children with rheumatic heart disease. Few data on the number of children with congenital heart disease in crippled children's programs are available for the decade 1940 to 1950, but reports which we do have suggest that the number was increasing. As could be expected, among the children referred for suspected rheumatic heart disease were children with congenital heart defects.

In 1939, the same year the appropriation was increased for crippled children, Gross (*1*) reported the first successful surgical treatment of a patient with patent ductus arteriosus. In 1945, Gross (*2*) and also Crafoord (*3*) published reports of the correction by surgery of coarctation of the aorta. At about the same time, Blalock and Taussig (*4*) reported the results of surgical treatment of pulmonary stenosis and pulmonary atresia; Potts' modification (*5*) came in 1946. Also in 1945, Gross (*6*) first reported the surgical treatment of congenital vascular ring (double aortic arch). In 1948, Brock (*7*) reported the feasibility of a direct surgical attack on congenital pulmonary stenosis.

Thus within a 10-year period, tremendous advances were made in the surgical correction of congenital malformations of the circulatory system, chiefly by surgery on blood vessels. Significantly, an early beginning of intracardiac surgery by Brock (*7*) foreshadowed the brilliant successes which were to follow. Prior to and concurrent with these advances in surgery, diagnostic skills and techniques were being developed and knowledge of physiology and the dynamics of the circulation was being advanced.

Guided by the principle that these surgical advances should be translated into benefits for children, State agencies for crippled children began to arrange care for those children whose defects were amenable to treatment by the procedures then available. A State having a medical center equipped for adequate diagnosis and surgery was frequently called upon to arrange care by other States without such a facility. This was difficult administratively and at times impossible if the State making the request had

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legal prohibitions against paying for out-of-State care. Appeals to the Children's Bureau for help came from both States and parents.

Because of the publicity given the announcement of the Blalock-Taussig operation, children from all over the world came to the Johns Hopkins Hospital for cardiac evaluation and treatment. The problem of their care became so acute that the hospital sought the assistance of the Maryland State Department of Health, which in turn approached the Children's Bureau. Therefore, in January 1949, the Children's Bureau approved a special B grant to Maryland for services to out-of-State children with congenital heart disease. This grant, which antedated the establishment of regional congenital heart centers, has continued ever since. In March 1950, the Technical Advisory Committee on Programs for the Care of Children with Rheumatic Fever and Heart Disease to the Children's Bureau recommended that every effort be made to provide diagnostic and treatment services to children with congenital heart disease.

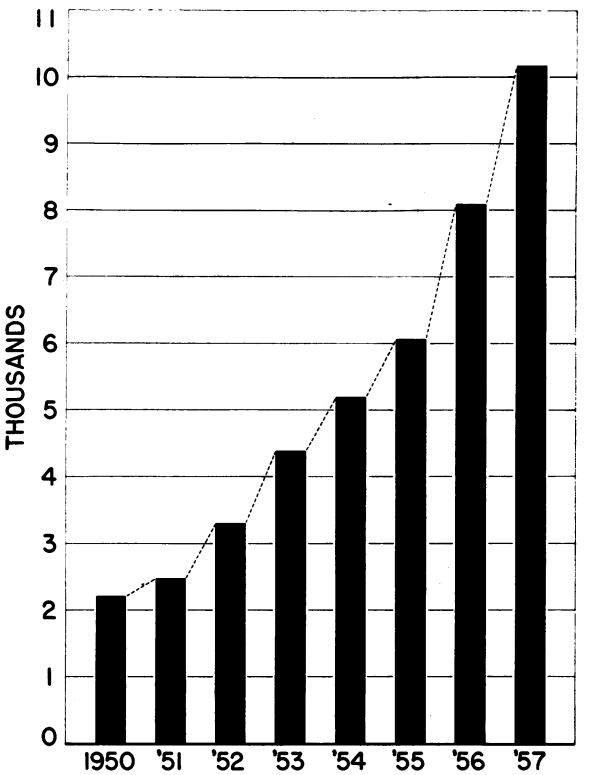
As a consequence of these developments, beginning in July 1951, the Children's Bureau set aside annually $100,000 of reserve fund B for support of regional congenital heart centers. Medical centers which were outstanding and had a record of successful cardiac surgery were to be designated as regional centers provided: the capacity of the center was such that an additional number of children could be served there; the location of the center was such that it would easily serve adjoining States; and the crippled children's agency in the State was willing and able to administer a regional program. Treatment centers were to be located throughout the country in such a way as to provide full geographic coverage.

Five States are now administering regional congenital heart programs. They are: Maryland, Illinois, Minnesota, Texas, and California.

Administration

Though there are some differences, the pattern of administration of the five regional congenital heart centers is much the same. In effect, the crippled children's agency of the State where the medical center is located acts as the agent, and takes responsibility for arranging the kinds of services needed by children referred by other State agencies, including financial arrangements. It also acts as a liaison between the regional center and the referring State.

Figure 1. Children with congenital heart disease served in the crippled children's program, 1950–57



In general, the States send their cases to the most adjacent center. However, the skill and reputation of the physicians at a particular center, as well as the preferences of the State agency, the child's private physician, and the parents, also determine the selection.

As in other official crippled children's programs, any child under 21 years of age is eligible for service.

Most cases treated by the regional centers are known to the crippled children's agency of the referring State and complete records are sent to the agency of the State where the center is located. Not only is medical data transmitted, namely, provisional diagnosis, history, physical examination, X-ray and laboratory data, but

identifying, social, and financial data as well. Wherever possible, the referring agency works out in advance a complete plan for the child and for at least one parent who must accompany him. This plan includes transportation of child and parent, and arrangements for board and lodging of the parent while the child is at the center. It indicates what payments, if any, parents, voluntary agencies, health insurance, and the referring State agency are prepared to make toward the cost of treatment. Eligibility for acceptance under the regional program is determined by the referring State, medical need being the primary consideration. Determination of financial need is based on a review of such information as cost of care, family income, size of family, outstanding financial obligations, and availability of health insurance. Because of the high cost of cardiovascular surgery, a relatively larger proportion of families are in need of at least partial assistance in the congenital heart program.

The prime objective of the regional heart program is to correct congenital cardiovascular defects. Therefore, after review of available medical data, those children whose conditions are presumed to be operable are selected by the center's staff. Before proper treatment can be planned for a child, however, his exact malformation and cardiac function must be determined; this may require extensive studies at the center. Even if an operation is not advised, referred children are the responsibility of the regional program as long as they remain at the center. If inoperable when first seen, the child is placed on a proper medical regimen and the center keeps a record of the child and his defect so that he can be recalled if later advances in surgical treatment offer an opportunity to improve his condition. Intercurrent illnesses which develop during the stay of the patient at the center may also be covered by funds for the regional heart program.

In general, transportation of parent and child to the center and board and room for parent and child are the responsibility of the referring State agency; inpatient hospital care, including medical consultations, special nursing care, and blood, is the responsibility of the State agency administering the regional heart program. In some cases diagnostic studies, if done on an outpatient basis at the center, are paid for by the referring State. Convalescent care, if needed, may or may not be paid from regional program funds.

As a basis for future planning for the care of children with congenital heart disease, the Children's Bureau needed information regarding the use which was being made of regional centers. Therefore, in 1952 an individual record form was adopted. It was designed to show disposition of each application and to present some key facts about each child, such as diagnosis, types of care provided and their costs, and the results of treatment. Regional centers began submitting case summaries in 1952; at the end of 1956, individual records were discontinued and an annual summary report substituted. During this period more than 934 different children received services under the regional congenital heart center program. Omitted from this analysis are a very few cases seen in one center which accepted children for only a short period and from which there is incomplete reporting. Also omitted is an unknown number of cases from another center which failed to send in reports for 1956. Together, these omissions are not a substantial number. This analysis, therefore, covers the cardiac treatment of 934 children under the

Table 1. Children referred to regional congenital heart centers, by number and by referring State, 1952–56

Number of children	Number of States	States
Total	43	
Less than 5	19	California, Illinois, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Minnesota, Mississippi, Montana, New Jersey, New York, Ohio, Oklahoma, Puerto Rico, South Carolina, Washington, Wyoming, Canal Zone.
5–9	5	Arkansas, District of Columbia, Georgia, Tennessee, Virginia.
10–19	9	Alaska, Delaware, Florida, Hawaii, Indiana, Michigan, North Carolina, Pennsylvania, Wisconsin.
20–29	2	Missouri, Nebraska.
30 and over	8	Arizona, Idaho, Maryland, Nevada, New Mexico, North Dakota, South Dakota, Texas.

Table 2. Sex and color of children served by the regional congenital heart program, 1952–56

Sex and color	Number	Percent [1]
Total	934	100.0
Sex:		
Male	429	46.0
Female	503	54.0
Unreported	2	
Color:		
White	822	89.3
Other	99	10.7
Unreported	13	

[1] Based on total, excluding unreported.

regional congenital heart program during the 5 years 1952 through 1956.

The regional congenital heart plan was conceived as a program to supplement, or in some cases to fill gaps in services, but not to supplant the services of State crippled children's agencies. Also, it was regarded as a temporary plan which would not be needed after adequate treatment facilities became available in all States. That it has been a relatively small part of the total crippled children's program for children with congenital heart disease is borne out by the fact that in 1957 the 686 childden who received services in the regional centers represented less than 7 percent of the children with congenital heart disease who received physicians' services in official State crippled children's programs.

Findings

Table 1 shows the States which referred children to the regional centers for the period 1952–56. States with fewer facilities such as Nevada, New Mexico, Arizona, North Dakota, and South Dakota referred relatively larger numbers of children to the regional centers than States such as California, New York, Illinois, and Massachusetts which had their own treatment facilities.

Fifty-four percent of the children seen under the program were girls. In one center the proportion of girls was almost as high as 59 percent. The children were 89.3 percent white and 10.7 percent nonwhite (table 2). This percentage is lower than the proportion of nonwhite to white children in the total population (13 percent), or in the entire crippled children's program (16 percent) in 1956.

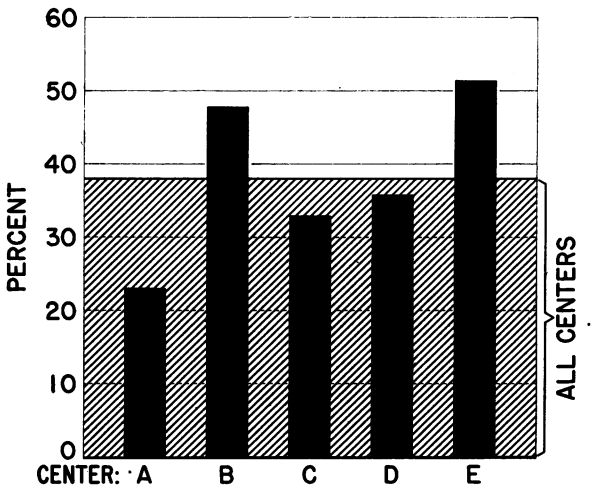
Table 3 shows the ages of the children when they were first brought to the centers. The majority were seen before the age of 5 years. The largest number for any one year of age was seen in their first year of life, the second largest number in their second year of life.

Table 3. Children receiving and not receiving surgery under the regional congenital heart program, by age, 1952–56 [1]

Age (years)	Number			Percentage distribution by age			Percentage distribution for each age group		
	Total	Surgery	No surgery	Total	Surgery	No surgery	Total	Surgery	No surgery
Total	934	354	578	100.0	100.0	100.0	100.0	38.0	62.0
Under 5	470	163	306	50.3	46.0	52.9	100.0	34.8	65.2
Under 1	150	40	110	16.1	11.3	19.0	100.0	26.7	73.3
1	107	34	73	11.5	9.6	12.6	100.0	31.8	68.2
2	79	33	45	8.4	9.3	7.8	100.0	42.3	57.7
3	57	22	35	6.1	6.2	6.1	100.0	38.6	61.4
4	77	34	43	8.2	9.6	7.4	100.0	44.2	55.8
5–9	258	107	151	27.6	30.2	26.1	100.0	41.5	58.5
10–14	137	62	74	14.7	17.5	12.8	100.0	45.6	54.4
15–19	54	19	35	5.8	5.4	6.1	100.0	35.2	64.8
20	6	2	4	.6	.6	.7	[2]	[2]	[2]
Unreported	9	1	8	1.0	.3	1.4	[2]	[2]	[2]

[1] Two children excluded. No determination available on whether or not they received surgery.
[2] Not computed. Base too small.

Figure 2. Percentage of children served at five centers who received surgery under the regional congenital heart program, 1952–56



In the first 3 years of life, the percentage of children who received surgery increased progressively from about 27 percent under 1 year to approximately 32 percent at 1 year and 42 percent at 2 years. At ages 9 and 10 more than one-half of the children received surgery.

Only about 38 percent of the children in the five regional centers received surgical treatment under the regional heart program during the 5-year period 1952–56 (fig. 2). Some children had surgery before 1952, after 1956, under private auspices, or under a State program, and thus their operations were not counted in this study. During this period, however, a number of children were operated on more than once but were counted as one surgical case, for example, repair of patent ductus followed later by correction of coarctation of the aorta, and a few children had more than one shunting operation, sometimes each of a different type. In addition, a very few children had noncardiac surgery, which was also excluded from this count.

Comparison of the percentage of cases treated surgically at the different regional centers showed variation from 51 percent to 23 percent.

Some of the more common reasons why surgery was not performed were: inoperable defect at this time; essentially correctable condition, return later after more experience has been gained; await open heart surgery; postpone till child is older; defect slight, present disability does not justify the risk of surgery; death of child before date set for surgery; presence of other severe handicaps more disabling than the heart defect; presence of intercurrent infections, especially respiratory infections and measles.

Sometimes parents refused to permit an operation on their child. Some of their reasons for refusal included: probable benefit would not justify risk; change of residence, request for transfer to another center; and diagnostic studies or intercurrent illness delayed operation so long that parents had to return home because of family duties or because father had to return to his job.

In some cases the surgical schedule was so crowded that an appointment could not be given until a later date. In 1957, operation on a large number of cases ready for surgery had

Table 4. Condition of children at discharge who received surgery and no surgery under the regional congenital heart program, 1952–56

Condition at discharge [1]	Number				Percent [2]	
	Total	Surgery	No surgery	Unknown	Surgery	No surgery
Total	934	354	578	2	100.0	100.0
Good	342	225	116	1	64.7	20.7
Fair	148	43	105	0	12.4	18.7
Unimproved	342	31	310	1	8.9	55.4
Died	78	49	29	0	14.1	5.2
Unreported	24	6	18	0		

[1] Time of discharge means the last time a child was seen in a regional center.
[2] Based on total, excluding unreported.

to be postponed because funds for the regional congenital heart program were depleted. In 1958, funds were again inadequate.

For those children receiving surgery, nearly two-thirds were described as being in good condition at the time of discharge from the center (table 4). Mortality in surgically treated cases was 14 percent, in nonsurgical 5 percent. A followup study to learn how many children died following their return home and how many continued to do well would be of great value. Some of the children who died without surgery had extremely complex defects, a few were admitted in extremis, and eight died in heart failure. Of those children who did not receive surgery, more than half were unimproved; in contrast, only 9 percent of the surgically treated cases were unimproved. Though a few cases received open heart surgery in 1956, for the most part the period covered by this analysis preceded the open heart era.

Forty of the patients receiving surgery were under 12 months of age upon admission. Nearly half (18) died. Twelve of the deaths were among the 23 infants under 6 months of age. The condition of the infants receiving surgery under the program at discharge was as follows:

	Age (months)	
Condition at discharge	*Under 6*	*6–12*
Good	7	7
Fair	3	2
Unimproved	1	2
Died	12	6
Total	23	17

There were only two cases of patent ductus among these infants, both of whom did well. The three most frequent diagnoses among them were: tetralogy of Fallot (11), tricuspid atresia (6), and transposition of great vessels (4).

Table 5 shows the days of hospitalization for the children receiving surgery; in some instances they represent two or more periods of inpatient care. Nearly half of the cases were hospitalized between 1 and 2 weeks, a quarter were in the hospital between 2 and 3 weeks, one-eighth between 1 and 3 months, and 3 cases as long as 3 months or more.

Table 6 summarizes the diagnostic data as reported by the regional centers. In many cases detailed medical notes copied from the hospital records give supplementary information about the condition of the child and his treatment during his stay at the center in addition to diagnosis. As one might anticipate, a definitive diagnosis had not been established as yet in every case; in slightly more than one-tenth of the cases the diagnosis was reported as probable or questionable.

Tabulation of the medical data presented some difficulty because of variations in reporting diagnostic information. Also, some children had not only complex cardiovascular defects to which no one diagnostic label could be applied, but also other concurrent conditions as well. It was decided in this presentation to give priority to the cardiovascular anomaly (if present) even though other more serious conditions coexisted.

The first 15 diagnoses listed in table 6 occurred in combination with another defect. Thirteen other children had even more complex defects, namely three or more congenital cardiovascular anomalies occurring simultaneously. These were listed under "miscellaneous congenital heart conditions—complex conditions." In each of these children, there was a different combination of defects. Eight of these children died.

Although the first 15 diagnoses, listed in descending order of frequency, occurred in combination, the first 11 of them also occurred

Table 5. Number of days of hospitalization of children having surgery under the regional congenital heart program, 1952–56

Days of hospitalization	Children who received surgery	
	Number	Percent [1]
Total	354	100.0
Under 7	19	5.4
7–14	169	48.3
15–21	87	24.9
22–28	27	7.7
29–89	45	12.9
90 and over	3	0.8
Unreported	4	---

[1] Based on total, excluding unreported.

singly and with 1 exception occurred more frequently alone than in combination.

The three most frequent malformations by far were: ventricular septal defect which occurred 181 times, alone in 135 children and associated with another cardiovascular defect in 46 children; patent ductus arteriosus, 177 times, alone in 147 children and in combination with other defects in 30 children; and tetralogy of Fallot, 170 times, alone in 164 children and combined with an additional defect in 6 children. More than half of the children who were seen at the regional centers had one of these three defects.

Following in importance according to frequency were: pulmonary stenosis, atrial septal defect, and coarctation of the aorta, transposition of great vessels, aortic stenosis, truncus arteriosus, and tricuspid atresia.

In 57 cases of congenital heart disease, the exact defect was undetermined. In all of these, further diagnostic studies were indicated; in some, the malformations were so complex that even with extensive studies an exact diagnosis was not possible. In a few cases diagnostic studies were not completed for a variety of reasons, such as child's condition became critical during catheterization, was too serious to permit extensive studies, or was so mild that it was deemed inadvisable to risk further studies.

In 21 children the diagnosis was rheumatic heart disease; 1 of these, a 14½-year-old girl, was operated on for relief of "far-advanced mitral stenosis."

Five cases of heart disease were classified as neither congenital nor rheumatic, for example, one case of tuberculous pericarditis with effusion and one of toxic myocarditis.

In 29 children no heart disease was found, 24 probably had functional murmurs and no other pathology, 2 had mediastinal tumors, 1 an enlarged thymus, 1 a nutritional anemia with hemic murmur, and 1 had pleuropericardial adhesion with distortion of pericardium and cardiac displacement with no evidence of cardiovascular disease.

We think it is fair to say that usually the most difficult cases are sent to the regional centers. One has only to review the protocols of children treated in the regional centers to realize what complex defects some of them had, how desperately ill some of them were on arrival, and what unpredictable and severe complications a few of them developed. The individual record form asked for "other conditions." Probably this item was under-reported.

Twenty-nine children had associated congenital malformations. Included in this group were two cases of mongolism and one other case of mental retardation with a rectal stricture. Excluded were four other cases of mental retardation from unknown cause. Five of these 29 children had multiple congenital deformities. Four had cleft palate; four had situs inversus of abdominal organs; and three had congenital cataracts. One of the children with congenital cataracts also had a hearing loss; it was stated that the mother had German measles in the first trimester.

Twenty-seven serious infections were reported. Five children had subacute bacterial endocarditis (three of the five were cases of tetralogy of Fallot). Reflecting the improved therapy of this condition, none died at the centers and two were reported in "good" condition. Three children had brain abscesses; three children had tuberculosis, one of these had tuberculous pericarditis. Pneumonia was a complication in four cases.

Nineteen children had neurological complications. The seven cases of mental retardation and the three cases of brain abscess have been previously mentioned. Two cases of cerebral palsy were treated for congenital heart disease. One postoperative case of tetralogy of Fallot developed cerebral thrombosis with residual hemiplegia; a 3-month-old infant with transposition of great vessels had a massive bilateral cerebral hemorrhage. One child with coarctation of the aorta and patent ductus had postoperative paraplegia.

Conclusion

Tribute is due the State crippled children's agencies which administer these regional programs. It was a sizable task to submit the records on which this analysis is based. The administration of this program has not been easy, partly because there were patients who did not apply through their home State crippled children's agency. For example, there were emergency cases or destitute families who

Table 6. Diagnoses of children served by the regional congenital

Diagnoses [1]	Children with reported diagnoses (unduplicated count)		Number of diagnoses reported [2]
	Number	Percent	
Total	934	100.0	1,035
Ventricular septal defect	(181)		181
Alone	135	14.5	135
In conjunction with:			
Patent ductus arteriosus	11	1.2	11
Atrial septal defect	6	.6	6
Coarctation of aorta	2	.2	2
Pulmonary stenosis	22	2.4	22
Transposition of great vessels	3	.3	3
Aortic stenosis	2	.2	2
Patent ductus arteriosus	(166)		177
Alone	147	15.7	147
In conjunction with:			
Tetralogy of Fallot	2	.2	2
Ventricular septal defect	[3]		11
Atrial septal defect	3	.3	3
Coarctation of aorta	9	1.0	9
Pulmonary stenosis	2	.2	2
Aortic stenosis	3	.3	3
Tetralogy of Fallot	(168)		170
Alone	164	17.6	164
In conjunction with:			
Patent ductus arteriosus	[3]		2
Atrial septal defect	2	.2	2
Aneurysm	1	.1	1
Double aortic arch	1	.1	1
Pulmonary stenosis	(65)		89
Alone	53	5.7	53
In conjunction with:			
Patent ductus arteriosus	[3]		2
Ventricular septal defect	[3]		22
Atrial septal defect	9	1.0	9
Single ventricle	3	.3	3
Atrial septal defect	(49)		69
Alone	39	4.2	39
In conjunction with:			
Tetralogy of Fallot	[3]		2
Patent ductus arteriosus	[3]		3
Ventricular septal defect	[3]		6
Coarctation of aorta	2	.2	2
Pulmonary stenosis	[3]		9
Transposition of great vessels	1	.1	1
Mitral stenosis	1	.1	1
Anomalous vessels	6	.6	6
Coarctation of aorta	(42)		55
Alone	35	3.7	35
In conjunction with:			
Patent ductus arteriosus	[3]		9
Ventricular septal defect	[3]		2
Atrial septal defect	[3]		2
Transposition of great vessels	1	.1	1
Mitral stenosis	1	.1	1
Aortic stenosis	3	.3	3
Single ventricle	1	.1	1
Aneurysm	1	.1	1
Transposition of great vessels	(28)		33
Alone	26	2.8	26
In conjunction with:			
Ventricular septal defect	[3]		3
Atrial septal defect	[3]		1
Coarctation of aorta	[3]		1
Single ventricle	2	.2	2
Aortic stenosis	(19)		27
Alone	19	2.0	19
In conjunction with:			
Patent ductus arteriosus	[3]		3
Ventricular septal defect	[3]		2
Coarctation of aorta	[3]		3
Truncus arteriosus	(20)		20
Alone	19	2.0	19
In conjunction with biloculate heart	1	.1	1
Single ventricle	(3)		9
Alone	3	.3	3
In conjunction with:			
Coarctation of aorta	[3]		1
Pulmonary stenosis	[3]		3
Transposition of great vessels	[3]		2
Mitral stenosis	(4)		6
Alone	4	.4	4
In conjunction with:			
Atrial septal defect	[3]		1
Coarctation of aorta	[3]		1
Anomalous vessels	(—)		6
In conjunction with atrial septal defect	[3]		6
Aneurysm	(—)		2
In conjunction with:			
Tetralogy of Fallot	[3]		1
Coarctation of aorta	[3]		1

Diagnoses [1]	Children with reported diagnoses (unduplicated count)		Number of diagnoses reported [2]
	Number	Percent	
Double aortic arch	(—)		1
In conjunction with tetralogy of Fallot	(3)		1
Biloculate heart	(—)		1
In conjunction with truncus arteriosus	(3)		1
Tricuspid atresia	20	2.1	20
Endocardial fibroelastosis	13	1.4	13
Eisenmenger complex	9	1.0	9
Atrioventricular communis	6	.6	6
Ostium primum	3	.3	3
Taussig-Bing heart	3	.3	3
Miscellaneous congenital heart conditions [4]	(23)		23
Complex conditions	13	1.4	13
All other	10	1.1	10
Congenital heart disease, type undetermined	57	6.1	57
Rheumatic heart disease	21	2.2	21
Heart disease, other than congenital or rheumatic	5	.5	5
No heart disease	24	2.6	24
Other than heart disease	5	.5	5

[1] In general, the arrangement of diagnoses is according to incidence.

[2] The count in this column is by individual diagnoses whether occurring singly or in dual combinations. Any combination of three or more diagnoses is counted once, due in part to difficulties in determining satisfactorily the exact number of conditions. This slight undercount probably does not affect the total number of diagnoses significantly.

[3] No entry is made here because this combination of diagnoses is shown above in reverse order.

[4] Included are multiple diagnoses of three or more conditions, and certain other cardiovascular conditions infrequently reported.

arrived at the center without an appointment, so-called "door-step cases," or cases known only to the center hospital which was unaware of the inadequacy of family resources before admission of the patient, or those children whose parents appealed directly to the President, their Congressman, or the Children's Bureau.

Perhaps the most serious problem has been the inadequacy of funds to meet the demand for service. It was predicted when the regional congenital heart program was launched that the amount of money available to it would probably be too small to meet the demand for services. It was estimated at that time that the average cost per case for diagnostic, surgical, hospital, and related services would be in the neighborhood of $1,000 which, if approximately correct, meant the amount appropriated would permit complete treatment service for only 100 children per year in the regional centers. The prediction that funds would be inadequate has been borne out with experience. In fiscal year 1958 the Children's Bureau increased the allotment to regional heart centers to $248,270; in fiscal year 1959, to $330,000. Both years the demand for services greatly exceeded the amount of funds available so that before the first half-year was over, centers had to refuse services to children unless the home State could pay the total cost of their care.

None of the crippled children's programs which States administer is static, but the unusually rapid advances in the treatment of congenital heart disease have made administration especially difficult. In spite of expenditure of time and effort in trying to arrive at average cost, no figure which is entirely satisfactory has been found. The problem is not only that costs for comparable services are rising, but with rapid advances in the treatment of defects of different types and increasing complexity, more and more complicated diagnostic and treatment procedures are required. Certain generalizations about costs can be made, however. Cost of hospitalization exceeds all other costs as a major item of expense; costs rise as complexity of defect or of corrective surgery increases.

In reviewing the records, occasional mention of health insurance was noted; it was probably under-reported. In about 13 percent of all cases, there was evidence that the family had some type of insurance which paid part of the bill. About one-fifth of the surgical cases, or a higher proportion than the nonsurgical, had some insurance.

We have ignored the human side of the program in this analysis. The anxiety which con-

genital heart disease produces in parents, their gratitude when a heavy financial burden is eased by the regional program, their relief and happiness when the surgeon tells them, "his heart is now normal, and he can gradually assume the activities of a normal child," is another story.

What of the future?

The chief cause of heart disease in childhood is now congenital heart disease (*8*). Hope for children with this condition improves daily as mortality from intracardiac surgery declines and the results continue to improve, also as new treatments are found to help children with more and ever more complex defects and as surgical treatment becomes possible even in the early months of life, when congenital heart disease is a particularly serious problem. Approximately three-fourths of all deaths due to congenital heart disease occur during the first year of life.

No matter how excellent treatment eventually becomes, our ultimate goal is the prevention of congenital heart disease. Though this goal seems far from fulfillment today, hopefully it may be attained in the not too distant future.

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PHS Appointments

David E. Price, M.D., chief of the Bureau of State Services, Public Health Service, for the last 2½ years, has been named deputy director of the Service's National Institutes of Health, a position vacant since the retirement of Dr. Cassius J. Van Slyke in December 1959. This appointment and the following key staff changes become effective July 1, 1960.

Theodore J. Bauer, M.D., deputy chief of the Bureau of State Services since 1956, succeeds Dr. Price as bureau chief; and Kenneth M. Endicott, M.D., who has been associate director of the National Institutes of Health since 1959, will serve as director of the National Cancer Institute, succeeding Dr. John R. Heller, who will be on leave to serve as president of the Memorial Sloan-Kettering Cancer Center in New York City.

Robert L. Zobel, M.D., has been appointed medical officer in charge of the Indian Health Area Office at Albuquerque, N. Mex. Since 1958, he has directed Indian health services in Idaho, Oregon, Washington, Montana, and Wyoming.

Dr. Price was first assigned to the National Institutes of Health in 1946, taking part in developing the research grants program. Associate director of extramural affairs at the institutes for 2 years, he was named Assistant Surgeon General in 1952, and in May 1957, deputy chief of the Bureau of Medical Services.

Dr. Bauer served as chief of the Venereal Disease Division from 1948 to 1953, when he was named chief of the Communicable Disease Center in Atlanta, Ga. Dr. Endicott was chief of the Cancer Chemotherapy National Service Center of the National Cancer Institute for 3½ years, after serving as scientific director of the Division of Research Grants from 1951 to 1955.