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Multidisciplinary Standardized Care for Acute Aortic Dissection

Design and Initial Outcomes of a Regional Care Model

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"No physician can diagnose a condition he never thinks about."

—*Michael DeBakey*

Patients with acute aortic dissection (AAD) have an in-hospital mortality of 26%, and for those patients with type A AAD, the mortality risk is 1% to 2% per hour until emergency surgical repair is performed.[1,2] It is therefore critical that AAD be recognized promptly and that surgical care be provided expeditiously. Data from the International Registry of Acute Aortic Dissection (IRAD) indicate that the median time from emergency department (ED) presentation to definitive diagnosis of AAD is 4.3 hours, with an additional 4 hours between diagnosis and surgical intervention for type A patients.[2,3] A portion of the delay to surgery is often the result of the patient's presenting to smaller community hospitals underequipped to manage emergent AAD. Transfer to high-volume aortic care centers with highly specialized facilities and expertise is routine, but even at such centers, current surgical mortality is 25%.[4]

Goals and Vision of the Program

In an effort to address factors that delay AAD recognition and optimal management, a standardized, quality-improvement protocol for the regional treatment of AAD was developed and implemented with the goal of providing consistent, integrated, and coordinated care for patients with AAD throughout all phases of care. Modeled, in part, after a successful regional program for ST-segment elevation myocardial infarction,[5], the specific aims of the program were to decrease the time from hospital arrival to diagnosis and treatment and to improve clinical outcomes for patients with AAD. A collaborative team designed program elements directed at (1) increasing awareness and knowledge of AAD among emergency care providers, (2) standardizing optimal care for AAD through the use of a formal protocol, (3) improving care coordination and communication across disciplines, and (4) providing feedback and quality improvement to treating clinicians. This report highlights key components of the protocol, the process of implementation, and initial clinical outcomes.

Methods

Local Challenges in Implementation

An interdisciplinary committee (cardiologists, cardiovascular [CV] surgeons, vascular medicine and surgeons, cardiac anesthesiologists, radiologists, AAD program nurses, community and tertiary hospital ED physicians, and a CV administrator) worked to define an ideal AAD care pathway extending from rural hospital diagnosis to tertiary care hospital discharge, and the following areas were targeted for process improvement: (1) delayed initial diagnosis, (2) nonstandardized diagnostic testing and pharmacotherapy, (3) delays occurring between community hospital presentation and interhospital transfer, (4) delays between AAD center arrival and the initiation of surgical care, (5) delays in availability and preparation of blood products for transfusion, (6) inconsistent provision of intraoperative aortic imaging; and (7) inconsistent follow-up after discharge.

Design of the Initiative

Regional Network

The Minneapolis Heart Institute at Abbott Northwestern Hospital (hereafter referred to as the AAD Center) is a tertiary hospital with existing relationships with a large number of rural and community hospitals (hereafter referred to as community) throughout the upper Midwest. The current program involves 32 community hospitals in Minnesota, North Dakota, and western Wisconsin that received program-related education, protocols, and toolkits and referred patients to the AAD Center for advanced AAD care. The majority of

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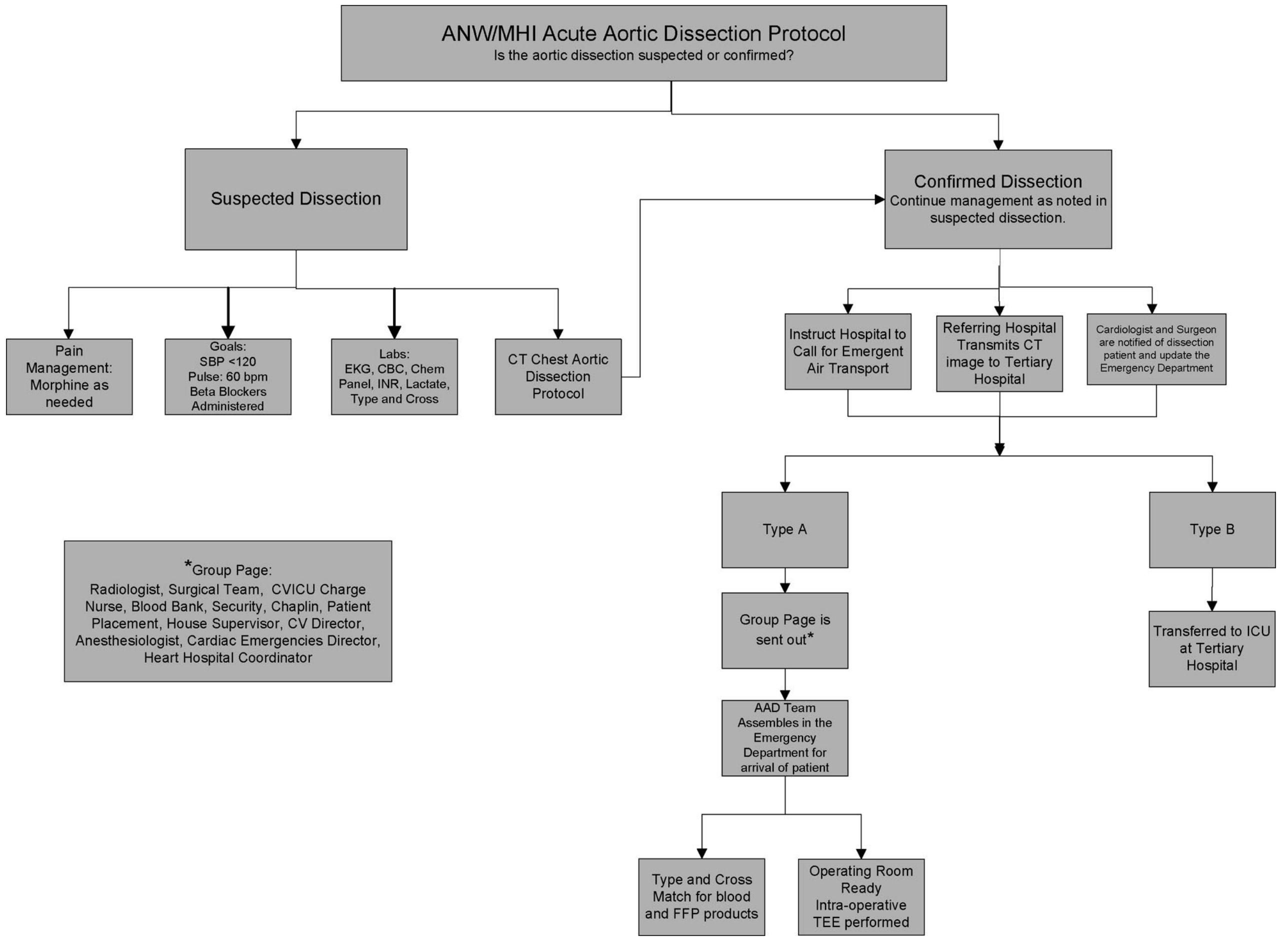

Figure. Flow diagram outlining the clinical pathway of patients with suspected or confirmed AAD.

the community hospitals were part of a defined network of facilities ("in-network") that receive ongoing CV continuing medical education through the regional level 1 ST-segment elevation myocardial infarction program.[5] Six additional hospitals that participate less formally in these regional CV programs ("out-of-network") also referred AAD patients during the study period.

Provider Education

Since the inception of the AAD program in 2005, >60 educational AAD talks and training sessions have been offered to local EDs, at primary care and emergency medicine continuing education conferences, and at regional medical transport bases. A cardiologist or CV surgeon and the program director visited each hospital in the regional network and conducted training sessions (please see online data supplement for Appendix). In addition to dissemination of the protocol and tools, program education also includes site-specific feedback to participating referring physicians, hospitals, and transport teams after each AAD event.

Implementation of the Initiative: Standardized AAD Protocol

Initial Management at Community Hospitals

Standardized order sets for the initial management of AAD, including pharmacotherapy and diagnostic guidelines and AAD Center contact phone numbers, were provided to community hospitals. On confirmation of an AAD, the community hospital staff alerts the transport service and the AAD Center and administers recommended medications (labetalol or esmolol) to achieve desired parameters (systolic blood pressure 100 to 120 mm Hg and heart rate 60 to 80 beats/min), provided that the patient is not hypotensive or bradycardic[6] (Figure).

Chest computed tomography (CT) was selected as the primary diagnostic imaging method.[7,8] A standardized imaging protocol applied across participating hospitals eliminates the need for repeated testing, promotes efficient activation of the surgical team, and thereby reduces time to treatment, radiation exposure, and cost. All CT scans are obtained, transmitted, and interpreted on a priority basis. Initial images are obtained without contrast to exclude intramural hematoma, followed by multislice spiral CT scans of the chest and abdomen with a 2.5-mm slice thickness, with contrast. In 45% of the participating community hospitals ($n=14$), CT images are transmitted to the tertiary hospital radiologist via the Picture Archiving and Communication Systems network for confirmation before patient transfer. Where this capability does not exist, the image is interpreted locally and saved on a disk that is transported with the patient. To ensure consistency of image reporting, a standardized report template containing a schematic diagram is used to illustrate and record key aspects of the dissection.

Interhospital Coordination and Transport

On confirmation or suspicion of an AAD at a community hospital, 1 phone call activates the protocol. A nurse coordinator at the AAD Center is assigned to assist with transfer arrangements and receipt of the patient. A cardiologist and CV surgeon review the case with the ED or transferring physician, and cases are designated as confirmed or suspected. Suspected AAD cases are those with suggestive but not definitive imaging results at the community hospital. All major ground and air medical-transport service providers in the region participated in AAD protocol training and education. Standardized medication guidelines are used to maintain hemodynamic goals en route, and transport personnel provide an estimated arrival time as well as a "15-minute out" page to AAD Center personnel. The AAD Center radiology department is informed of the pending patient arrival time, so that transported diagnostic images can be expeditiously interpreted on arrival.

AAD Center ED

The AAD Center ED serves as the stabilization site. A cardiologist, available in-house 24 hours, directs initial patient management in the ED, with the CV surgeon assuming leadership of the AAD team once the diagnosis is confirmed. An electronic AAD toolkit, which includes estimated transport times, community hospital contact information, and guidelines for initial management, is available. Computer stations in the ED were upgraded to enable immediate review of CT scans. In cases of suspected AAD, where images from the community hospital are unavailable or inconclusive, definitive imaging is performed immediately on arrival.

In confirmed type A cases, the CV surgeon determines whether the patient is a surgical candidate, initiates the AAD surgical order set in the electronic health record, and pages the multidisciplinary AAD team, including the CV operating room (CVOR). The OR order set includes preoperative antibiotics and antihypertensive medications, as well as a priority request from the blood bank of red blood cells (4 units of crossmatched or O-negative red blood cells), 4 units of fresh frozen plasma, and 2 units of platelets. Coronary angiography is not performed routinely. The AAD team anesthesiologist performs an assessment of the patient and transports him/her to the CVOR.

Surgical Management

Patients with AAD are classified as type A (involving the ascending aorta) or type B (confined to the descending aorta) in accordance with conventional criteria. Consistent with IRAD, patients with aortic intramural hematoma were included in the analyses, whereas patients with giant penetrating ulcers were excluded. An aortic intramural hematoma involving the ascending aorta is treated with immediate surgical intervention, similar to a type A aortic dissection, whereas type B aortic dissections (or intramural hematomas) are treated initially with medical therapy unless there are indications for emergency surgical intervention.[9]

A dedicated CVOR is readily available and prepared when a confirmatory page is received. Appropriate venous access is established, and arterial and central lines are placed. Once the patient is anesthetized, intraoperative transesophageal echocardiography (TEE) is performed. The TEE confirms the diagnosis, delineates aortic valve involvement, and provides a means of intraoperative monitoring and planning.[10] The blood bank is notified of any potential need for additional blood products, including platelets, cryoprecipitate, and factor VII. A consistent surgical management approach for the repair of type A AADs with techniques that have been well described[11,12] is promoted by the dedicated group of 4 CV surgeons who share call and have performed all emergent aortic repairs at the hospital in recent years. Although every attempt is made to spare the valve by using Dacron interposition grafts, composite grafts are used when needed. Circulatory arrest is used routinely when arch repair is performed and otherwise at the discretion of the surgeon. An open aortic anastomotic technique for reconstruction of the native aortic distal anastomotic site is preferred. Intraoperative TEE continues after separation from cardiopulmonary bypass to aid in assessment of the repair and aortic valve function.

Discharge and Follow-Up

At discharge, all patients are scheduled for a 3-month, outpatient follow-up visit at a dedicated aortic care clinic. Follow-up imaging is scheduled in accordance with consensus recommendations.[6] Imaging is preferentially done with magnetic resonance imaging. Echocardiograms are conducted before discharge and annually in patients with interposition grafts. The AAD team communicates the follow-up plan with the patient's primary care physician, and a patient information sheet regarding AADs and the importance of follow-up is reviewed with the patient.

Program Evaluation

Case Ascertainment and Definitions

Outcomes were assessed before (January 1, 2003 to July 31, 2005) and after (August 1, 2005 to September 1, 2009) protocol initiation. Cases were identified either retrospectively through hospital discharge diagnosis codes or prospectively after protocol initiation. The study was reviewed and approved by the Abbott Northwestern Hospital institutional review board. All patients were included in the results of the quality-assurance program unless they signed "no" to research process. In addition, patients who survived signed a consent for long-term follow-up. A comprehensive database is used to collect all relevant data abstracted by specially trained clinical research assistants and is reviewed for accuracy by the lead cardiologist (K.M.H.). Location of initial presentation was categorized as community or tertiary (AAD Center). Community hospitals were further designated as in-network and out-of-network, as noted earlier.

The outcomes assessed were (1) time from presentation to confirmed diagnosis for all AAD patients and for type A patients undergoing surgical treatment, (2) time to OR, (3) use of β-blockers on arrival and at discharge, (4) use of intraoperative TEE, and (5) in-hospital all-cause mortality. Time to OR (minutes) was defined for surgically managed type A patients and represented either the time from confirmed diagnosis to the OR (patients presenting to the AAD Center) or the time from the AAD Center arrival to the OR (patients presenting at community hospitals).

Statistical Analysis

Between January 1, 2003 and September 1, 2009, 107 cases of AAD were treated at the AAD Center. The analysis includes 101 (30 preprotocol, 71 postprotocol) cases in the analyses (5 patients who did not consent to research and 1 with iatrogenic dissection were excluded). Patients who did not present directly to an ED or who had a dissection discovered incidentally by imaging were excluded from the analyses of time from presentation to diagnosis (n=4) and time to OR (n=3). χ^2 or Fisher exact test was used to assess the statistical significance of categorical variables, and t tests were used to test for differences in continuous variables before and after protocol implementation. Time segment values (in minutes) were transformed to natural logarithms (time-segment values) to more closely approximate a normal distribution and are reported as median and interquartile range (25th and 75th percentiles). t Tests were performed on logarithmic (time) values to test for differences in times before and after protocol. A value of $P \leq 0.05$ was considered statistically significant, and all reported probability values are 2 sided. Statistical calculations were done in Stata 10.0 (Stata Corp, College Station, Tex).

Results

Success of the Initiative

The mean patient age was 64 years and 55% were men (Table 1). The majority were type A dissections (68%) who were transferred from community hospitals (76%). Seven cases (2 preprotocol, 5 postprotocol) of type A dissection were managed medically because of comorbid conditions, often in the very elderly (including bowel infarction, severe chronic obstructive pulmonary disease, shock, unresponsiveness, or multisystem organ failure) for whom the option of surgery was considered but the surgeon and patient/family opted to pursue a hospice approach. An additional 2 type A dissection patients died before surgery could be performed (both in the postprotocol group). The postprotocol type A patients had more significant comorbid complications, including hypotension, neurologic deficits, cardiac tamponade, and myocardial ischemia (data not shown). Two postprotocol patients with type B dissections underwent endovascular interven-

Table 1. Characteristics of Patients With AAD

Characteristic	All (N=101)	Before Protocol (n=30)	After Protocol (n=71)	P Value
Age, y	64±17	64±18	64±17	0.89
Male	56 (55)	19 (63)	37 (52)	0.30
Transfer*	77 (76)	22 (73)	55 (77)	0.66
Type A dissection	69 (68)	22 (73)	47 (66)	0.48
Type A, surgical	60 (59)	20 (67)	40 (56)	0.33
Type B dissection	32 (32)	8 (27)	24 (34)	0.48
Medical history				
Hypertension	76 (75)	24 (80)	52 (73)	0.47
Diabetes	5 (5)	2 (7)	3 (4)	0.63
Marfan syndrome	3 (3)	1 (3)	2 (3)	1.00
Bicuspid aortic valve	7 (7)	5 (17)	2 (3)	0.02
Prior cardiac surgery	1 (1)	0 (0)	1 (1)	1.00
Chest pain at presentation	73 (72)	23 (77)	50 (70)	0.52

Values expressed as mean±SD or No. (%).

*Patient initially presented at a community hospital and was transferred to a tertiary facility.

tion. CT scans were performed as the initial imaging modality in 86% of cases. More than 1 imaging study was required for confirmation of the diagnosis in 47% of cases. Among the 101 cases, the diagnostic imaging modality was CT scan, aortogram, magnetic resonance imaging, or TEE in 90%, 4%, 3%, and 3%, respectively.

Table 2 presents a comparison of the time from initial presentation to confirmation of the AAD diagnosis before and after protocol implementation. Overall, there was a 43% reduction (median, 279 to160 minutes; $P=0.014$) in the time to diagnosis, driven primarily by a significant improvement among those patients initially evaluated at community hospitals and those with type B dissection. In patients transferred from community hospitals to the AAD Center, the median time from initial presentation to confirmed diagnosis was reduced by almost 4.5 hours. In the small number of patients presenting directly to the AAD Center, the time from presentation to diagnosis increased slightly but remained dramatically shorter than for patients initially presenting at community hospitals.

Among type A AAD patients undergoing surgical intervention, the median time from presentation to the OR decreased 30% after implementation of the protocol, driven by the reduction in community hospital values (median, 728 to 366; $P=0.039$; Table 3). Patients presenting at in-network community hospitals appeared to benefit most, with a 57% reduction in the median delay between presentation and surgical intervention. Median time (within the AAD Center) from diagnosis to OR in type A AAD patients decreased by 55% after protocol implementation (median, 113 to 51; $P=0.006$; Table 3), and despite an emphasis on reducing critical time segments, there were no instances of surgical intervention occurring as the result of a false-positive diagnosis.

Table 2. Time From Presentation to Confirmed Diagnosis of AAD, Before and After Protocol Implementation, by Type of Dissection and Hospital of Initial Presentation

Characteristic	Before Protocol n	Before Protocol Time		After Protocol n	After Protocol Time		P Value
Type A and B							
All hospitals	30	279	(109, 945)	67	160	(82, 288)	0.014
Tertiary	8	84	(70, 134)	13	124	(84, 160)	0.733
Community (all)	22	437	(233, 1290)	54	175	(82, 379)	0.002
Community (in-network only)	22	437	(233, 1290)	45	168	(82, 379)	0.003
Type A only							
All hospitals	22	246	(96, 838)	44	176	(101, 405)	0.388
Tertiary	6	71	(69, 96)	9	134	(84, 162)	0.403
Community (all)	16	437	(212, 1020)	35	196	(101, 452)	0.115
Community (in-network only)	16	437	(212, 1020)	27	187	(101, 873)	0.176
Type B only							
All hospitals	8	331	(134, 2340)	23	110	(74, 180)	0.0023
Tertiary	2	134	(127, 140)	4	97	(56, 120)	0.36
Community (all)	6	883	(303, 3272)	19	120	(74, 201)	0.0015

Time values (in minutes) are expressed as median (25th percentile, 75th percentile). Four patients were excluded from these analyses owing to unclear presentation time.

After program implementation, the percentage of nonhypotensive patients receiving β-blockers on arrival at the AAD Center increased dramatically to 97% (Table 4). In addition, 100% of AAD patients were prescribed β-blockers at discharge in the postprotocol period, compared with only 85% in the preprotocol period. Intraoperative TEE was used in nearly all types of A AAD repair procedures. The in-hospital mortality for type A cases undergoing surgical repair demonstrated a trend toward reduction (43% lower) compared with the mortality observed before protocol implementation. Among those patients who survived to hospital discharge, the rate of follow-up care in the outpatient setting within 6 months of the index event was 75% before protocol and 85% after protocol (P=NS).

Summary of the Experience, Future Directions, and Challenges

A multidisciplinary AAD program can be successfully implemented by using a standardized protocol within a regional hospital network. The AAD program reduced the length of time to both diagnosis and surgical repair, increased the use of β-blockers and intraoperative TEE imaging, and led to a trend suggesting a modest decrease in short-term mortality. The key components of the program are highlighted in Table 5 and reflect the broad, integrative nature of the new AAD care model. The program is anchored by an organizational infrastructure that includes a central tertiary hospital with a small group of CV surgeons and a network of community hospitals with refined transfer systems and strong collaborative ties to the

Table 3. Time to OR in Surgically Managed Type A AAD Patients, Before and After Protocol Implementation, by Hospital of Initial Presentation

	Before Protocol			After Protocol			
Variable	n	Time		n	Time		*P* Value
Time from initial presentation to OR							
All hospitals	20	482	(252, 1137)	37	338	(223, 586)	0.188
Tertiary	5	192	(136, 219)	7	233	(165, 295)	0.421
Community (all)	15	728	(369, 1487)	30	366	(229, 784)	0.039
Community (in-network only)	15	728	(369, 1487)	22	316	(216, 1099)	0.056
Time from diagnosis to OR*	20	113	(51, 174)	37	51	(34, 98)	0.006

Values are expressed as median (25th percentile, 75th percentile). Three type A surgically managed patients treated after protocol implementation were excluded from these analyses owing to unclear presentation time.

*Within tertiary facility.

AAD Center. The AAD program includes a well-defined AAD clinical care protocol, system enhancements, educational components, and electronic support tools.

Timely clinical intervention is essential for successful AAD management, but clinical presentations that often mimic more common acute coronary syndromes frequently impede rapid diagnosis. One of the primary program objectives through educational sessions was to increase awareness of the condition as well as recommended guidelines for initial acute management. The intent was to promote appropriate consideration of AAD in the differential diagnosis of acute chest pain and to provide physicians with explicit clinical guidance, because recall of proper treatment can be unreliable with uncommon conditions, given the adverse consequences that can result from administering acute coronary syndrome therapies in a misdiagnosed AAD patient.[13] The index of suspicion should be low for an ED physician to exclude dissection.[14] Once recognized, an integrated, coordinated transfer program helps overcome a significant barrier to optimal care in the transfer of critically ill patients.[15]

Table 4. β-Blocker Use and Use of Intraoperative Imaging in AAD Before and After Protocol Implementation

β-Blocker Use*	Before Protocol	After Protocol	*P* Value
All AADs			
On arrival (All)	14/22 (64)	59/61 (97)	<0.0001
On arrival (in-network only)	14/22 (64)	52/54 (96)	<0.001
At discharge†	18/20 (90)	52/52 (100)	0.021
Type A AADs			
On arrival (all)	7/14 (50)	37/38 (97)	<0.001
On arrival (in-network only)	7/14 (50)	31/32 (97)	<0.001
At discharge†	12/14 (86)	33/33 (100)	0.026
Type B AADs			
On arrival (all)	7/8 (88)	22/23 (96)	0.46
On arrival (in-network only)	7/8 (88)	21/22 (95)	0.47
At discharge†	6/6 (100)	19/19 (100)	1.0
Intraoperative TEE‡	5/20 (25)	39/40 (98)	<0.0001
In-hospital mortality, %			
All AADs	10/30 (33)	19/71 (27)	0.51
Type A surgical AADs	7/20 (35)	8/40 (20)	0.21
Type B AADs	2/8 (25)	5/24 (21)	1.0

Values are expressed as No. (%).

*Excludes patients who were in shock and hypotensive (n=12).

†Among survivors.

‡Type A surgical patients only.

Sources of delay at the tertiary facility were addressed by providing advanced activation of the AAD team, ensuring a well-orchestrated receipt of the patient in the ED and expedited transit to the CVOR. Direct transport from the ED to the CVOR was a protocol element aimed at reducing patient transition time, as transferred patients had previously been admitted to internal medicine service, critical care, or telemetry beds while awaiting availability of the CVOR. Together, these system-wide education and coordination efforts resulted in a 43% reduction in time to diagnosis for all cases of AAD and a 55% reduction in time from diagnosis to intervention in surgically managed type A patients.

In addition to reducing diagnosis and treatment delays, this initiative succeeded in achieving extensive application of 2 highly beneficial care elements. First, 97% of patients without contraindications are now receiving β-blockers during the initial management phase. β-Blockade, the principle pharmacotherapy recommended for AAD,[6,7] decreases the force of left ventricular ejection (dP/dt), thus minimizing further damage to the aorta. A second, intraoperative TEE is now used in 98% of surgical repair procedures for type A dissection.[10,12]

Knowledge of the epidemiology, pathogenesis, and clinical course of AAD has improved considerably in the past several decades,[16] in large part owing to the IRAD consortium and others.[2,4,7,12] To date, a primary strategy for improving AAD outcomes has been the identification of progressive surgical approaches to emergency repair, the merits of which have been confirmed by retrospective studies documenting longitudinal improvements in mortality.[11,12] We sought to implement an innovative program that would transcend surgical approaches to AAD and address early recognition and initial management as important determinants of AAD outcomes. To our knowledge, this is the first report regarding the impact of a regional AAD care model on clinical end points and time to diagnosis and treatment.[17] Rather than focusing on care

Table 5. Key Elements of a Regional Program To Improve Treatment of AAD

Infrastructure

- Centralized, tertiary aortic treatment center with small dedicated group of CV surgeons
- Regional network of hospitals and transport services dedicated to optimal management of cardiac emergencies
- Multidisciplinary AAD committee to develop, facilitate, and monitor program
- Site-specific systems at community hospitals that enable rapid patient transport

Clinical Care Objectives

- Increased awareness and rapid recognition of AAD signs and symptoms
- Guideline-based defined pharmacotherapy goals for initial management:
  - Administration of β-blockers
  - Systolic blood pressure between 100 and 120 mm Hg
  - Heart rate between 60 and 80 beats per minute
  - Administration of morphine
- Standardized CT imaging and reporting protocol
- Standardized approach to surgical repair
- Intraoperative TEE
- Follow-up monitoring schedules and discharge instructions based on published recommendations

Systems

- Single phone call activates the protocol
- Group page to mobilize AAD team at tertiary hospital
- Formalized clinical protocol for initial management
- "15-Minutes-out" page from transport personnel to cue preparations at tertiary hospital

Education

- Training sessions for emergency care providers at regional hospitals and transport bases (ie, signs and symptoms, protocol for initial remote management)
- In-depth performance review to referring hospital within 24 hours of every AAD case

Electronic Tools

- Menu of tools to support interhospital communications and patient transport
- Electronic CT image transfer from community to tertiary hospital, where available
- ED computer stations at tertiary hospital enabled with CT reading capability for immediate interpretation of hand-carried scans obtained at community hospital
- Dedicated AAD database for tracking patients and monitoring program progress
- Order sets in electronic medical record

rendered within the tertiary facility, our program aims to improve AAD outcomes through a systems-based, multidisciplinary, interfacility approach, with modifications to the care model across the continuum of the patient experience from presentation to discharge and follow-up. The incorporation of AAD-related electronic tools is another unique element of the program and represents an attempt to capitalize on emerging health information technology. Additionally, the program is supported by detailed data collection, which allows the AAD committee to direct quality improvement.

The success of the regional ST-segment elevation myocardial infarction program provided an impetus for the current program and a robust framework for this novel AAD program.[5] Many of the principles effective in improving care of ST-segment elevation myocardial infarction, including an integrated approach, teamwork, standardized admission and discharge orders, and data feedback,[5,18] were modeled in the AAD program. It should be emphasized that no new technologies or significant financial costs were required to implement the program.

Several limitations of this study should be acknowledged. Owing to the emergent nature of this uncommon condition, studies of AAD are compromised by lack of randomization and small sample size, and in fact, no randomized trials of AAD interventions have been reported.[16] Despite observing a large geographic area during a period of 6 years, the final sample size for our analyses was small, particularly when analyses were restricted to surgically managed cases. Although the identical data collection instrument was used for all cases, information on cases occurring after introduction of the IRAD database system at Minneapolis Heart Institute was collected prospectively, whereas earlier cases required retrospective medical record review. This analysis does not include patients who died before diagnosis, and thus, there is inherent selection bias that does not allow definitive conclusions regarding how successful the program was in improving overall recognition of AAD. Finally, the generalizability of this AAD care model is likely limited by the fact that the supportive, regional infrastructure and electronic functionality necessary for broad implementation of a program of this kind is not widely available.

Future Directions

One key source of delay not addressed by this program is the time that the symptomatic AAD patient spends at home before hospital presentation. As with myocardial infarction, patients frequently do not recognize the symptoms of AAD as warranting emergency care, and 1 of 5 AAD patients does not present at a hospital until >6 hours after symptom onset.[19] In recent years, AAD has received noteworthy attention in the lay press owing to the tragic death of actor John Ritter and others.[20,21] The release of an inaugural set of guidelines for the management of aortic disease by the American College of Cardiology and American Heart Association Task Force on Practice Guidelines will further increase visibility and education concerning AAD. Patient education is critical, as patients with a family or personal history of aortic aneurysmal disease often must rely on their own personal advocacy to obtain aorta-specific testing.[20] A patient handout and a website with informational links were developed as part of the current program, but there is opportunity to include more active forms of patient education. Arguably of equal importance to increasing awareness is the elucidation of clinical presentation and diagnostic factors associated with prolonged time to diagnosis and intervention.[3,22] Determination of the most significant sources of delay in terms of patient characteristics and diagnostic approaches will better equip physicians, and particularly the unacquainted physician, to promptly and accurately recognize these often-lethal events.

Conclusions

These data demonstrate that a multidisciplinary, standardized approach to the diagnosis and treatment of individuals with AAD can shorten critical time segments in a large geographic region. This systematic approach to AAD care represents a new paradigm for the treatment of this life-threatening condition.

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Disclosures

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