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Atrial Fibrillation

Part I: Classification, Presentation, and Diagnostic Evaluation

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Atrial fibrillation (AF) is the most common sustained dysrhythmia in the United States, affecting an estimated 2.2 million adults.[1] AF is also the most common dysrhythmia in emergency medicine.[2] With rare exception, AF is non-lethal.[3] However, it is a progressive disease, with 30% of paroxysmal AF eventually becoming chronic.[4] AF rarely occurs in the first two decades of life, but it has been reported in the fetus and neonate, in whom it almost always is associated with an accessory atrioventricular (AV) pathway.[5] In adolescents, AF has been reported in association with hyperthyroidism, dilated and hypertrophic cardiomyopathy, and accessory pathway conduction.[6,7] AF is common in the elderly and in patients with organic heart disease.[8] Cardiogenic thromboembolism from AF accounts for two-thirds of stroke in patients older than age 60.[9]

Duration of AF and frequency of its recurrence differentiate the various forms of the dysrhythmia. Paroxysmal AF lasts fewer that seven days and is separated by prolonged periods of normal sinus rhythm (NSR). Paroxysmal AF recurs approximately 30% of the time, and its prevalence often is underestimated because it may be asymptomatic.[10] Chronic AF, on the other hand, lasts longer than seven days, usually without interceding NSR.[11] The first episode of persistent AF, or the first time that AF is discovered, is called "recent-onset atrial fibrillation." Chronic AF is approximately twice as common as paroxysmal AF or recent-onset AF.[10]

The prevalence of AF varies with age and patient population. In general, AF affects 3-5% of the population older than age 60 and is associated with organic heart disease in 70-80% of those affected. "Idiopathic" or "lone" AF occurs in 3-31% of all cases and is named because of the absence of any detectable causes, including hyperthyroidism, sinus node dysfunction, or ventricular preexcitation.[4,5,12]

According to the 1985 report from Framingham, the relative risk for developing stroke in persons with AF is 4.1%, and stroke is the most important outcome affecting morbidity and mortality associated with the dysrhythmia.[5,8]

When presented with a patient in AF, the emergency physician (EP) quickly must evaluate, stabilize, and treat the patient according to his or her underlying disease state to minimize morbidity and mortality. Accordingly, the goals of therapy include: 1) control of ventricular rate; 2) restoration of normal sinus

rhythm; 3) maintenance of normal sinus rhythm; and 4) prevention of thromboembolism.[5,13] (See Table 1.) The following article will provide the EP with an understanding of the classification of AF, its pathophysiology, treatment strategy, medications used in its treatment, and considerations for treating AF associated with other medical conditions.

—The Editor

Classification

AF may not represent a single entity and may be understood and studied better when assigned to a classification system. Consistent nomenclature should be used when describing AF. Consistency in the literature, however, is lacking. Bellet's classification divides AF into three types (See Table 2): paroxysmal, chronic, and recent-onset. Paroxysmal AF is recurrent episodes of AF lasting more than two minutes but fewer than seven days.[8] Chronic AF lasts more than one month.[14] Recent-onset AF is persistent AF lasting seven or more days but less than one month.[14] Some studies call the dysrhythmia "persistent" if it lasts seven or more days but less than one month, while others, implying similar causation, lump AF of different durations into the same study population.[8]

Differences in the type of AF have treatment implications, and classification of the dysrhythmia based on the emergency patient population may be more appropriate. A proposed classification of AF based on emergency department (ED) population, duration of the arrhythmia, and response to treatment has been suggested as follows: 1) AF lasting fewer than 72 hours; 2) persistent AF lasting 72 hours or more; and 3) permanent AF. A recent study recognized that AF lasting fewer than 72 hours may convert spontaneously to NSR or may be converted using pharmacological or electrical means without grave consequences. Untreated AF lasting more than 72 hours became persistent and was more resistant to cardioversion.[2] This implies that some forms of AF that fail to terminate early may be differentiated from those that do, which has implications for further patient testing and treatment.

Prevalence, Epidemiology, and Outcome

Prevalence. AF is more common than ventricular dysrhythmias.[13] The overall prevalence of AF in the general population is between 0.4% and 0.9%.[5] The relative prevalences are one-quarter paroxysmal, one-half chronic, and one-quarter recent-onset.[10] (*See Table 2.*)

Prevalence varies with age group and patient population. Atrial fibrillation affects 2.3% of persons older than age 40, 3-6% older than age 60, and 8.8% older than age 80.[13,15,16] (*See Table 3.*) Seventy percent of patients are between ages 65 and 85.[16] The median age for AF is 75.[13] On average, men get AF at a younger age than women do. The mean age for AF in men is 66.5 years, compared with 71.4 in women.[16] The male to female ratio for AF decreases after age 50; after age 75, most of the patients with AF (approximately 60%) are women.[16]

Conditions Associated with AF. Half of the patients with paroxysmal AF have underlying heart disease.[10] Among all patients with AF, 70-80% have cardiovascular diseases,[8] the most common being hypertension, coronary artery disease (CAD), and myocardial diseases.[10] *(See Table 4.)* Risk factors for AF include rheumatic heart disease, hypertension, diabetes (in women), left ventricular hypertrophy, CAD (mainly in the elderly and patients with left ventricular dysfunction),[8] and mitral valve prolapse.[13] As many as 40% of patients with overt congestive heart failure (CHF) will develop AF.[4] Underlying heart disease is significantly more common in women who have AF than in men with AF.[10] Rheumatic valvular disease is present in one-quarter of women with AF but in only 8% of men with AF.[10] Other conditions associated with AF include hypertrophic cardiomyopathy, dilated cardiomyopathy, pericarditis, left atrial myxoma, congenital heart disease (such as atrial septal defect), mitral stenosis, AV valvular disease, acute myocardial infarction, cardiac and non-cardiac surgery, diuretic use, advancing age, higher levels of systolic blood pressure, increased height, ele-

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vated blood glucose, enlarged left atrial size, hyperthyroidism, cholinergic drug use, and pulmonary conditions that cause hypoxemia, such as chronic obstructive pulmonary disease (COPD).[5,8] On the other hand, high serum cholesterol, beta-blocker use, and high forced expiratory volume in one second (FEV_1) reduce the risk of AF.[17] There has been a shift away from valvular etiologies toward nonrheumatic causes of AF in recent decades.[10]

Outcome. A spectrum of symptoms, from palpitations to dyspnea, that affect quality of life; hemodynamic consequences, such as pulmonary edema and hypotension; side effects of drugs used to control ventricular rate or maintain sinus rhythm; and thromboembolic complications make AF a potentially devastating condition.[13] AF increases mortality 100% compared with patients without the dysrhythmia. The Framingham study showed that AF increases mortality and that this association persists regardless of age, history of hypertension, diabetes, smoking, left ventricular hypertrophy on electrocardiogram (ECG), myocardial infarction, CHF, valvular heart disease, or cerebrovascular disease.[18] AF may be independent of cardiovascular disease in as many as 31% of patients and is called lone AF.[4]

Stroke Outcome for AF. Patients with rheumatic valvular heart disease, prior thromboembolism, CHF, hypertrophic cardiomyopathy, hypertension, diabetes, hyperthyroidism, and women older than age 75 are at high risk for thromboembolism.[19] Patients without hypertension, CAD, or CHF who also develop AF are five times more likely to have a stroke than those without AF.[20] CAD alone increases a patient's risk of stroke by two times, and CHF increases it by four times.[20] AF compounds the risk of stroke in patients with CAD and CHF, doubling the already increased risk of stroke in men and tripling it in women.[20] According to age, attributed risk of stroke from AF is 1.5% for patients in their 50s and rises to 30% for those in their 80s.[15,20] For patients in their 80s in the Framingham study, AF was the sole cardiac condition related to the incidence of stroke, suggesting that the elderly with AF particularly are vulnerable to stroke.[20] More than one-third, approximately 38%, of patients with AF due to non-rheumatic, non-valvular heart disease who suffer a stroke will die from that event.[21] For surviving patients who are not anticoagulated, the risk of a recurrent cerebrovascular event is approximately 20% per year.[21]

From 1987 to 1989, United States medical centers participated in the Stroke Prevention in Atrial Fibrillation (SPAF) study, which followed patients with AF for an average of 1.3 years.[15] CHF (within three months of AF onset), a history of hypertension, and prior thromboembolism each, independently, was associated with a greater than 7% per year risk for subsequent thromboembolism.[22] For patients without these risk factors, the risk was only 2.5% per year (1.4% per year in non-diabetics).[22] AF patients with two or three risk factors had a 17.6% per year risk of thromboembolism. AF, especially in the setting of other coexistent diseases, must be managed to prevent stroke and death.[22]

Etiology and Pathophysiology

Electrophysiologic Mechanisms of AF. There appear to be at least two distinct causes of AF. First, Moe proposed the "multiple wavelet hypothesis" that describes multiple, small, reentrant, electrical circuits in AF that constantly arise in the atria, collide, extinguish, and arise again. Approximately six electrical wavelets per second and a critical mass of atrial tissue are required to sustain AF.[12,23] The average number of wavelets, however, is fewer when the fibrillatory wavelength (the product of conduction velocity and refractory period) is longer, as occurs in coarse AF; there are more wavelets when shorter wavelengths are present, as in fine AF.[23] Anything that lengthens the wavelet wavelength tends to prevent or terminate AF, whereas anything that shortens the wavelet wavelength tends to induce or sustain it. Antiarrhythmic drugs can lengthen the wavelet wavelength, thus terminating AF.[23] Increased parasympathetic tone,[24] rapid atrial pacing, or intra-atrial conduction abnormalities can shorten the wavelength and perpetuate AF.[23]

Second, a rapidly firing automatic focus or foci located at sites near the sinus node, the coronary sinus in the right atrium, or the pulmonary veins in the left atrium can initiate AF.[12,25] AF caused by such foci may be amenable to radiofrequency catheter ablation, and patients may be identified for this curative procedure.[25] Patients who are likely to have a focal source are relatively young, of either sex, without structural heart disease, and have frequent episodes of paroxysmal AF, monomorphic premature atrial systoles, or both.[25] Both the right and left atria can be sources of atrial premature complexes that promulgate spontaneous AF.[26] It also is possible that separate mechanisms in the same patient cause AF.[5]

Atrial fibrillation may be present in patients who have other forms of supraventricular tachycardias, especially atrioventricular nodal reentry tachycardia (AVNRT) and atrioventricular reentry tachycardia (AVRT).[25] Elimination of the AVNRT or AVRT by radiofrequency catheter ablation also eliminates the AF in most of these patients.[25] It is, therefore, a logical conclusion that the supraventricular tachycardia in some way initiates the AF and is an example of a tachycardia-induced tachycardia.[25]

Atrial Remodeling. AF causes progressive electrophysiological and structural changes of the atria that incite and promote AF.[4] AF associated with structural heart disease commonly leads to atrial dilatation and patchy fibrosis ranging from scattered areas of scarring to diffuse involvement that may include destruction of the sinoatrial node.[5] Atrial scarring and fibrosis may, indeed, predispose the patient to the very dysrhythmia that caused the structural changes by increasing atrial susceptibility to autonomic stimuli or local myocarditis.[12] AF results in electrical changes, including inhomogeneity, greater dispersion, and shortening of atrial refractory periods, that may lead to persistence or recurrence of the dysrhythmia.[4,26] In addition, chronic effects of AF are characterized by

Table 1. Goals of Therapy in Atrial Fibrillation

1. Ventricular rate control
2. Restoration of normal sinus rhythm
3. Maintenance of normal sinus rhythm
4. Prevention of thromboembolism

Table 2. Classification and Characteristics of Atrial Fibrillation

TYPE	DURATION	FEATURES	RELATIVE PREVALENCE	SYMPTOMS
Paroxysmal AF	Longer than 2 min and shorter than 7 days	Intervening NSR, 30% recurs, 30% becomes chronic	1/4	Younger patients: Palpitations likely, often asymptomatic and circadian.
Chronic AF	Longer than 1 month		1/2	Older patients: Less symptomatic, dyspnea most common, 10% have prior thromboembolism.
Recent-onset AF (Persistent)	7 days or longer, but shorter than 1 month	First discovery of AF	1/4	Dyspnea is most common symptom.

decreased atrial contractility, shortened action potential duration, and attenuated action potential rate adaptation.[11] These effects have been demonstrated by intermittent rapid atrial pacing in goats.[4] This pacing technique causes shortening of atrial refractoriness with loss of rate adaptation and leads to an increase in the rate, inducibility, and sustainability of AF.[4] After 1-3 weeks of artificially maintained paroxysms of AF, the duration of the paroxysms becomes progressively longer, and the dysrhythmia becomes sustained.[4] It is said, "Atrial fibrillation begets atrial fibrillation."[25]

Electrophysiological Changes in the AV Node. Electrophysiology of the AV node is complex. Many antiarrhythmic medications work at the AV node to slow conduction, terminate reentrant rhythms, and control ventricular rate response to the fibrillating atria. The refractory period of the AV node is prolonged relative to that of the surrounding myocardium.[5] As an electrical impulse travels through the AV node, it encounters decremental conduction (a progressive decrease in the ability of the AV nodal cells to induce new action potentials along its course), and the impulse may encounter a conduction block.[5] A blocked impulse may impair AV conduction of subsequent atrial impulses. Conduction through the AV node can be modulated by autonomic influences or medications. An increase in sympathetic stimulation (as during exercise) or withdrawal of vagal inhibition facilitates conduction through the AV node.[5] Accessory AV pathways, such as those found in Wolff-Parkinson-White syndrome (WPW), do not share these electrophysiological properties with the normal AV node and, hence, do not respond to antiarrhythmic drugs the same way that the AV node does.[5]

The Possible Role of Calcium. Calcium in the electrolyte milieu at the cardiac myosite membrane may be an important factor in initiating and sustaining AF. Experimental animal models show a reduction (which may represent a down-regulation) in the L-type Ca2+ current (ICa) density in fibrillating myocytes.[11] ICa density also is found to be reduced significantly in myocytes of patients with chronic AF.[11] The reduction in myocyte ICa density in patients with chronic AF may be an adaptive response to arrhythmia-induced calcium overload.[11] Calcium's role in initiating or perpetuating AF is not fully understood nor is it understood how measurable serum calcium relates to this concept.

Natriuretic Peptides in AF. The association of AF with activation of N-terminal atrial natriuretic peptide (N-ANP) and brain natriuretic peptide (BNP) is uncertain but may be important for the future diagnostic uses for natriuretic peptides. Compared with patients in sinus rhythm, patients with AF show higher N-ANP levels but similar BNP levels.[27] Multivariate analysis shows that a higher N-ANP level is associated with higher likelihood of AF, symptom class, and endothelin-1 level independent of left atrial volume and left ventricular ejection fraction. BNP level shows no such association.[27]

Hemodynamic Effects of AF. Loss of AV synchrony and irregular RR intervals cause hemodynamic changes during AF. This effect is more pronounced in patients with diastolic dysfunction than in those with impaired systolic function. Myocardial contractility changes from beat to beat in AF because of the influence of the force-interval relationships between end-systolic volume and the preceding RR interval.[28] The irregular ventricular response to the fibrillating atria may cause a marked decrease in cardiac output, especially in those patients with impaired diastolic ventricular filling, mitral stenosis, restrictive or hypertrophic cardiomyopathy, or pericardial diseases.[5] For example, in dog hearts that are paced irregularly, cardiac output declines 15% compared with dog hearts that are paced regularly at the same average pacing rate.[5] Patients with rapid ventricular rates (usually greater than 130 beats per minute) sustained for several months are at risk for developing a tachycardia-induced cardiomyopathy, which often is reversible once sinus rhythm is restored.[5] Persistent tachycardia may lead to ventricular dysfunction.[12]

Left Atrial Appendage Flow and Hemostatic Markers. One study found that left atrial appendage flow is significantly slower in patients with AF than in those with sinus rhythm (mean velocity 33 ± 22 cm/second vs 61 ± 35 cm/second) and that a peak left atrial appendage antegrade flow velocity less than 20 cm/second is associated with the dense spontaneous echocardiographic contrast (SEC).[29] Slow left atrial appendage flow and the presence of left atrial SEC or thrombus found by transesophageal echocardiography (TEE) suggest an elevated thrombogenic state in the patient who has nonvalvular AF.[30] The maximum left atrial diameter is significantly greater and the left atrial expansion fraction significantly smaller in patients with slow left atrial appendage flow.[30] Plasma levels of hemostatic markers in peripheral blood (throm-

Table 3. Prevalence of Atrial Fibrillation in the General Population

AGE GROUP (YEARS)	PERCENTAGE OF POPULATION WITH AF	COMMENTS
40+	2.3%	
60+	3-6%	
(66.5)		Mean age for AF in men
(71.4)		Mean age for AF in women
(75)		Median age for all AF
Over 75		60% with AF are women
80+	8.8%	

Key: AF = atrial fibrillation

Table 4. Risk Factors for Atrial Fibrillation

CARDIOVASCULAR RISK FACTORS	NONCARDIAC RISK FACTORS
• Hypertension	• Advanced age
• Coronary artery disease	• Diabetes and elevated blood glucose
• Left ventricular dysfunction	• Chronic obstructive pulmonary disease
• Left ventricular hypertrophy	• Hyperthyroidism
• Hypertrophic cardiomyopathy	• Noncardiac surgery
• Dilated cardiomyopathy	• Diuretic use
• Valvular heart disease	• Hypokalemia-hypomagnesemia
• Congestive heart failure	• Elevated height
• Pericarditis	• Cholinergic drug use
• Atrial septal defect	• Pulmonary conditions leading to hypoxemia
• Left atrial myxoma	
• Sinoatrial node dysfunction	
• Ventricular preexcitation	
• Myocardial infarction	
• Elevated systolic blood pressure	
• Enlarged left atrial size	
• Cardiac surgery	

bin-antithrombin III complex, fibrinopeptide A, D-dimer, beta-thromboglobulin, and platelet factor 4) are elevated significantly in patients with slow left atrial appendage flow.[30] These patients are at risk for increased intravascular coagulation-fibrinolysis activity and platelet activation, and these abnormalities may be related closely to the thrombogenic state in patients with AF.[30]

Hemodynamic Changes after Cardioversion. After cardioversion of chronic AF, cardiac output declines in more than one-third of patients.[31] The cardiac depressant effects of anesthetics (used during cardioversion) or heart disease itself may contribute to reduced cardiac function.[31] In the majority of patients, however, cardioversion of chronic AF gradually increases cardiac output by approximately one-half during the month following restoration of sinus rhythm as left atrial mechanical strength increases and as the atrial myopathy subsides.[31]

Clinical Presentation

Presenting Symptoms in General. AF may occur: 1) as a primary dysrhythmia in the absence of structural heart disease; 2) as a secondary dysrhythmia in the absence of structural heart disease but in the presence of a systemic abnormality that predisposes the individual to the dysrhythmia; or 3) as a secondary dysrhythmia associated with cardiac disease affecting the atria.[5] Thus, when faced with recent-onset AF, it is important to search for an underlying cause, such as ischemic heart disease, hyperthyroidism, or electrolyte abnormalities.

Symptoms are present in almost 90% of patients with AF and are significantly more frequent in females than in males.[10] Patients with paroxysmal AF are younger and more likely to experience palpitations than patients with chronic AF, who are older and usually less symptomatic.[10] Some patients have minimal symptoms or none at all, whereas others may have severe symptoms, particularly at arrhythmia onset.[12] Factors affecting symptoms include ventricular rate, overall cardiac function, underlying medical conditions, and patient perception.[5] Asymptomatic patients usually present with a relatively controlled ventricular rate less than 100 beats per minute, whereas patients who are tachycardic may present with chest discomfort, cardiac ischemia, or overt pulmonary edema.[5] Symptoms range from occasional palpitations to severe dyspnea, but fatigue, dizziness, near syncope, and dyspnea are common.[5,12] Dyspnea, in fact, is the most common presenting symptom in chronic AF and recent-onset AF.[12,32]

In paroxysmal AF, asymptomatic episodes occur more frequently than do symptomatic ones, and palpitations are the most common complaint.[10,12] Paroxysmal AF does not occur randomly.[33] Instead, it exhibits a circadian rhythm with a double peak, one occurring in the morning and the other in the evening.[33] Moreover, there are substantially fewer episodes of paroxysmal AF on Saturdays; they are more frequent during the last months of the year.[33]

Prior thromboembolism may have occurred in 10% of patients with chronic AF.[10] Therefore, one must be sensitive to any subtle neurological changes found on examination or reported by the patient or historian. Neurological symptoms and the patient's underlying illnesses may help the EP decide whether a new stroke is due to AF. The sudden onset of neurological symptoms and a history of valvular heart disease predict a cardioembolic stroke. *(See Table 5.)* A subacute onset of symptoms and a history of COPD, hypertension, hypercholesterolemia, transient ischemic attack, ischemic heart disease, or diabetes predict an atherothrombotic stroke.[34] In addition, chronic AF may impair cognitive function of elderly patients as compared with that of age-matched controls in sinus rhythm.[12] It is unclear whether this impairment is due to recurrent cerebral embolism, cerebral hypoperfusion, or both.[12]

Diagnostic Studies

ECG. AF causes irregular multiform f waves (the irregular undulation of the baseline that is depicted in Figure 1) and an irregularly irregular ventricular response on ECG or cardiac rhythm strip.[35] *(See Table 6.)* The mean resting ventricular rate in

Table 5. Stroke Source

- History suggestive of cardioembolic stroke (more likely from AF)
- History suggestive of atherothrombotic stroke (less likely from AF)
- Sudden onset of neurological symptoms
- History of valvular heart disease
- Subacute onset of neurological symptoms
- History of COPD, hypertension, hypercholesterolemia, TIA, ischemic heart disease, diabetes

Key: AF = atrial fibrillation; COPD = chronic obstructive pulmonary disease; TIA = transient ischemic attack

Table 6. ECG Findings in Atrial Fibrillation

Rate	110-130 bpm	Typical of new-onset AF
	< 100 bpm	Consider medication effect
f wave	Undulating baseline	
RR interval	Irregularly irregular	
QRS	Typically narrow	
	Wide QRS may be associated with BBB, MI, aberrant conduction, ventricular tachycardia (if in series), ventricular preexcitation	

Key: bpm = beats per minute; AF = atrial fibrillation; BBB = bundle branch block; MI = myocardial infarction

a patient with new-onset AF is usually between 110 and 130 beats per minute,[12] but rates as high as 200 beats per minute may develop in the absence of rate-controlling medications.[35] The ventricular rate may be less than 100 beats per minute in patients who already are on antiarrhythmic medications. The EP should consider the possibility of digitalis toxicity when AF is accompanied by a regular ventricular rate.[35] An ECG showing AF is correctly identified by 31-91% of physicians, which suggests a large margin for improving ECG interpretation.[36]

Some medications used to slow AV conduction may enhance conduction down an accessory AV pathway, speeding ventricular response. A slow QRS upstroke may indicate the delta wave of ventricular preexcitation.[35] Wide QRS beats during AF are more likely to be due to aberration than to a coincidental ventricular premature beat or to ventricular tachycardia (if wide QRS beats occur in series).[35]

Echocardiography. Transthoracic echocardiography (TTE) has little value in treating the ED patient with AF.[37] TTE, however, may be useful to the cardiologist looking for high-risk features for AF, such as rheumatic valvular disease, hypertrophic cardiomyopathy, and left ventricular dysfunction.[19,38] Left atrial size, left ventricular wall thickness, and left ventricular function are independent risk factors for developing AF.[19] Left atrial size may have predictive value in determining the success of cardioversion and maintaining sinus rhythm, as well.[19] According to SPAF, left ventricular dysfunction by echocardiogram and enlarged left atrial size are the strongest independent predictors of subsequent thromboembolism.[39]

Echocardiography also is useful to the cardiologist for assessing cardiac structure and function and the presence of thrombus or dense SEC "smoke" in the left atrium or left atrial appendage.[37] In a multicenter trial, one study randomized 1222 patients with AF for more than two days to either treatment guided by TEE or conventional treatment, with three weeks of anticoagulation before cardioversion followed by four weeks of warfarin therapy after cardioversion.[40] There was no significant difference between the two groups in the rate of embolic events, but hemorrhagic events were significantly fewer in the TEE group, which also had a shorter time to cardioversion and a greater rate of successful restoration of sinus rhythm.[40] TEE, if readily available to the EP, shows promise in treating emergency patients with AF.

TEE is not readily available to the EP for assessing the hemodynamically unstable patient and mostly is used under controlled conditions in the electrophysiology lab by an echocardiographer who may use it to risk-stratify patients with AF or to identify patients who need prolonged anticoagulation.[37] Therefore, its use in AF is appreciated most easily in elective cardioversion of the hemodynamically stable patient. For patients with chronic AF, it is recommended that cardioversion be attempted in patients who have AF for less than one year and who have been anticoagulated for at least four weeks.[41] Alternatively, TEE may be used to screen the left atrium for thrombus in lieu of prior anticoagulation with heparin or warfarin.[41] Low molecular weight heparin may be used as a "bridge" to full anticoagulation with warfarin in stable patients undergoing elective TEE-guided cardioversion, and low molecular weight heparin may be self-administered on an outpatient basis.[42] For patients with a thrombus seen with the initial TEE, follow-up TEE to document thrombus resolution after 3-4 weeks of anticoagulation is recommended before cardioversion.[43] Likewise, TEE also may prove useful in identifying patients with a low clinical risk profile who may be treated with aspirin alone.[37]

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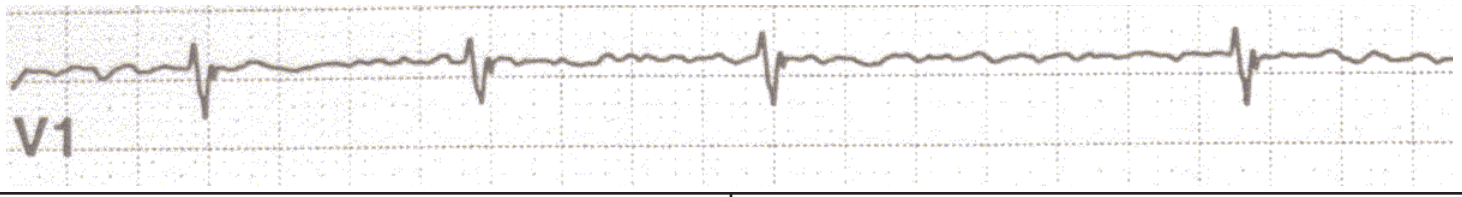
Figure 1. Atrial Fibrillation on Rhythm Strip



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Physician CME Questions

41. What is the most common dysrhythmia in emergency medicine?
    A. Brady-tachy syndrome
    B. Torsade de pointes
    C. Atrial fibrillation
    D. Wolf-Parkinson-White syndrome

42. What percentage of paroxysmal atrial fibrillation eventually becomes chronic atrial fibrillation?
    A. 20%
    B. 30%
    C. 40%
    D. 50%

43. AF will not be present in patients who have other forms of supraventricular tachycardia, such as AVNRT and AVRT.
    A. True
    B. False

44. Which of the following statements is true?
    A. Paroxysmal atrial fibrillation is more common than either chronic atrial fibrillation or recent-onset atrial fibrillation.
    B. On average, men get atrial fibrillation at a younger age than do women.
    C. As we age, the relative proportion of people with atrial fibrillation favors men.
    D. Prevalence of AF does not vary by age group.

45. Which of the following conditions is associated with AF?
    A. Enlarged left atrial size
    B. Tall height
    C. COPD
    D. Hyperthyroidism
    E. All of the above

46. Which of the following statements is true?
    A. Atrial fibrillation doubles mortality compared with those without atrial fibrillation.
    B. The risk of stroke from atrial fibrillation decreases with age.
    C. Approximately half of patients with atrial fibrillation due to nonrheumatic, nonvalvular heart disease who suffer a stroke will die from that event.
    D. In the Framingham study, AF was not related to the incidence of stroke among patients in their 80s.

47. Atrial fibrillation can be sustained by all of the following *except*:
    A. increased parasympathetic tone.
    B. rapid atrial pacing.
    C. intra-atrial conduction abnormalities.
    D. AV nodal ablation.

48. Structural, electrical, or neurological changes that may contribute to atrial fibrillation include:
    A. lengthening of the atrial refractory period.
    B. atrial scarring and fibrosis.
    C. improved action potential rate adaptation.
    D. increased vagal stimulation to the AV node.

49. What importance does the left atrial appendage have with regard to the development of thromboembolism in atrial fibrillation?
    A. The left atrial expansion fraction is significantly greater in patients with atrial fibrillation.
    B. There is no such relation.
    C. Plasma levels of hemostatic markers in serum are significantly lower in patients with slow left atrial appendage flow.
    D. Left atrial appendage antegrade flow less then 20 cm/second and the presence of dense spontaneous echocardiographic contrast suggests a high likelihood of thrombus formation in patients who have nonvalvular atrial fibrillation.

50. With regard to the patient presenting with atrial fibrillation:
    A. It is not necessary to search for underlying causes such as ischemic heart disease, hyperthyroidism, or electrolyte abnormalities since the dysrhythmia is usually self-limited.
    B. Younger female patients with paroxysmal atrial fibrillation will most likely present with symptoms then will older patients who have chronic atrial fibrillation.
    C. Symptoms may include palpitations, severe dyspnea, chest pain, syncope, or cardiovascular collapse.
    D. Both B and C are correct.

In Future Issues: **Atrial Fibrillation, Part II**

Emergency Medicine Reports CME Objectives

To help physicians:

- quickly recognize or increase index of suspicion for specific conditions;
- understand the epidemiology, etiology, pathophysiology, and clinical features of the entity discussed;
- be educated about how to correctly perform necessary diagnostic tests;
- take a meaningful patient history that will reveal the most important details about the particular medical problem discussed;
- apply state-of-the-art therapeutic techniques (including the implications of pharmaceutical therapy discussed) to patients with the particular medical problems discussed;
- understand the differential diagnosis of the entity discussed;
- understand both likely and rare complications that may occur;
- and provide patients with any necessary discharge instructions.

Emergency Medicine Reports
The Practical Journal for Emergency Physicians

Atrial Fibrillation, Part I

Classification and Characteristics of Atrial Fibrillation

TYPE	DURATION	FEATURES	RELATIVE PREVALENCE	SYMPTOMS
Paroxysmal AF	Longer than 2 min and shorter than 7 days	Intervening NSR, 30% recurs, 30% becomes chronic	1/4	Younger patients: palpitations likely, often asymptomatic and circadian.
Chronic AF	Longer than 1 month		1/2	Older patients: less symptomatic, dyspnea most common, 10% have prior thromboembolism.
Recent-onset AF (Persistent)	7 days or longer, but shorter than 1 month	First discovery of AF	1/4	Dyspnea is most common symptom.

Prevalence of Atrial Fibrillation in the General Population

AGE GROUP (YEARS)	PERCENTAGE OF POPULATION WITH AF	COMMENTS
40+	2.3%	
60+	3-6%	
(66.5)		Mean age for AF in men
(71.4)		Mean age for AF in women
(75)		Median age for all AF
Over 75		60% with AF are women
80+	8.8%	

Key: AF = atrial fibrillation

ECG Findings in Atrial Fibrillation

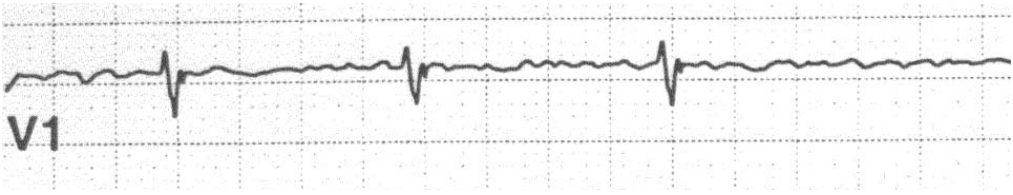
Rate	110-130 bpm	Typical of new-onset AF
	< 100 bpm	Consider medication effect
f wave	Undulating baseline	
RR interval	Irregularly irregular	
QRS	Typically narrow	
	Wide QRS may be associated with BBB, MI, aberrant conduction, ventricular tachycardia (if in series), ventricular preexcitation	

Key: bpm = beats per minute; AF = atrial fibrillation; BBB = bundle branch block; MI = myocardial infarction

Goals of Therapy in Atrial Fibrillation

1. Ventricular rate control
2. Restoration of normal sinus rhythm
3. Maintenance of normal sinus rhythm
4. Prevention of thromboembolism

Atrial Fibrillation on Rhythm Strip



Risk Factors for Atrial Fibrillation

CARDIOVASCULAR RISK FACTORS

- Hypertension
- Coronary artery disease
- Left ventricular dysfunction
- Left ventricular hypertrophy
- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Valvular heart disease
- Congestive heart failure
- Pericarditis
- Atrial septal defect
- Left atrial myxoma
- Sinoatrial node dysfunction
- Ventricular preexcitation
- Myocardial infarction
- Elevated systolic blood pressure
- Enlarged left atrial size
- Cardiac surgery

NONCARDIAC RISK FACTORS

- Advanced age
- Diabetes and elevated blood glucose
- Chronic obstructive pulmonary disease
- Hyperthyroidism
- Noncardiac surgery
- Diuretic use
- Hypokalemia-hypomagnesemia
- Elevated height
- Cholinergic drug use
- Pulmonary conditions leading to hypoxemia

Stroke Source

- History suggestive of cardioembolic stroke (more likely from AF)
- History suggestive of atherothrombotic stroke (less likely from AF)
- Sudden onset of neurological symptoms
- History of valvular heart disease
- Subacute onset of neurological symptoms
- History of COPD, hypertension, hypercholesterolemia, TIA, ischemic heart disease, diabetes

Key: AF = atrial fibrillation; COPD = chronic obstructive pulmonary disease; TIA = transient ischemic attack

Supplement to *Emergency Medicine Reports*, August 26, 2002: "Atrial Fibrillation, Part I: Classification, Presentation, and Diagnostic Evaluation." *Author:* **Donald A. Moffa, Jr., MD**, Associate Staff, Emergency Medicine, Cleveland Clinic Foundation, Cleveland, OH.

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Emergency Medicine Specialty Reports

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Ethical Issues in Pediatric Emergency Medicine: Children's Rights and Health

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The Convention on the Rights of the Child ("the Convention"), adopted by the General Assembly of the United Nations in 1989, places a clear obligation on health authorities and practitioners to evolve policy and practice in accordance with the human rights of children.[1,2] Making a commitment to respect the rights of children has profound implications for the status of children in our society. Nowhere is this more evident than in the field of health care, where the decisions and actions of professionals impact on children's lives in profound, intimate, and powerful ways. Children's rights generate obligations and responsibilities that must be honored.

Examination of two important principles in the Convention highlights the implications of taking a rights-based approach to children. Article 12 of the Convention states that all children capable of expressing a view have the right to do so freely in all matters of concern to them, and that their views shall be given due weight in accordance with their age and maturity. Respecting children's rights to be heard does not mean that their views must always prevail. However, it does mean that those views should inform decision-making processes on matters that concern them. This has significant implications for practice. It involves giving children the necessary information with which to participate fully in decision making. It must be emphasized that such information must be given clearly, sensitively, and at an appropriate pace for the individual child. Promoting children's active participation is important as a matter of principle—children, like adults, have a right to services that take account of their concerns, experiences, and views. But their participation is also valuable as a means of improving quality, raising standards, and ensuring the development of relevant and appropriate services.

An equally central principle is Article 3 of the Convention, which states that in all actions affecting the child, the best interests of the child must be a primary consideration. Giving primary consideration to the best interests of the child does have significant implications. It applies to decisions that affect the individual children—the nature of treatment, the decision to treat, and how that treatment is applied—but also requires giving consideration to children's best interests within the services as a whole.

If children's interests are to be a primary consideration in the broad provision of health services, then explicit consideration must be given to children in the allocation of budgets, the organization of services, and their inclusion in research programs. Children do not have access to the powerful lobbies that influence public policy. They cannot vote, and they rarely can advocate on their own behalf. It is too easy, therefore, for children's rights, needs, and interests to be swamped by more vociferous and influential voices. Without the vote and access to the arenas where decisions are made, children's rights have and will consistently be disregarded, unless adults are prepared to advocate on their behalf and create avenues through which children can be heard in their own right. Investment in children now is probably the most effective strategy for ensuring a stable, humane, democratic, and economically sound society of the future. The challenge rests with those who are committed to respecting children's rights and have the information and power to make a difference.

Informed Consent

Informed consent has become a widely accepted ethical and legal doctrine during the past half-century.[3] Requiring

physicians to seek the voluntary and informed consent of the patient (or from the patient's surrogate or guardian) before testing and treatment has become the ethical cornerstone of contemporary medical practice.[3,4]

The ethical and legal justification for requiring informed consent is respect for the autonomy and self-determination of patients. As free, autonomous human beings, patients have an ethical and legal right to consent to tests and therapies they wish to undergo and to refuse tests and therapies they do not want.[3]

A patient's consent becomes valid when three conditions are fulfilled: 1) adequate information has been provided to the patient by the physician to permit a rational treatment consent or refusal; 2) the patient possesses the capacity to make medical decisions; and 3) the treatment consent or refusal is made freely without coercion by persons or agencies.

Adequate information is that information which a reasonable person would require to make a treatment decision. Reasonable people need to know their choices; the general risks, benefits, and probable outcomes of their choices; and reasons for the physician's recommendation of the favored choice. Side effects of treatment should be discussed to the extent that they are common or serious.

The ability to participate in care decisions is called decision-making capacity.[4] This is distinct from the legal concept of competency, which only a judge has the authority to determine.[4] Decision-making capacity can and should be assessed by clinicians. In clinical settings, the capacity to consent to treatment frequently is referred to as "competence." In this nonlegal usage, competent means simply that the patient has the capacity to understand the context of the decision, the choices available, and the likely outcomes of the choices, and can process this information rationally to reach a decision about consent. Patients who are incompetent require a surrogate decision maker.

Lack of coercion means the absence of threats or other reasonable and irresistible external pressure to reach a particular decision. It is not coercive for a physician to make a strong treatment recommendation as long as the reasons for that recommendation are stated fairly and the facts are not exaggerated.[3]

The way in which physicians convey information to patients influences how the patients will respond. The effect of how the patient is presented information is called the framing effect.[3,5] There are numerous studies showing the importance of framing on patients' decisions. It is essential that physicians frame the information they convey to patients in the most honest and unbiased way. Afterward, they can provide their opinion about the treatment recommendation, but fact and opinion should be kept separate so a patient can agree with the physician about the facts but disagree about the opinion. As with many guidelines, one can fulfill the "letter of the law" without fulfilling the ethical spirit of obtaining informed consent. The best way to fulfill both senses is to be vigilant in pursuing the spirit of informed consent. Establishing the patient-physician relationship, providing disclosure of risks, and making the patient a full partner in decision making will improve the quality of the informed consent process and decrease the likelihood of litigation.[4]

A patient's signature on a written consent form is not the consent; it is merely the legal formalization of a preceding consent process of communication. Informed consent is a process, not an event.[3] It is an ongoing dialogue between physician and patient in which the physician explains and the patient asks questions and receives answers. Comprehension of medical data by patients is an ongoing process that requires continuous explanation. Ideally, the physician and the patient form a dyad that practices "shared decision-making." The physician brings facts about diagnosis, prognosis, treatment options and outcomes, and a treatment recommendation. The patient brings a unique set of personal values and preferences with which to interpret the medical data and recommendation, and then consents or refuses.

The patient who lacks decision-making capacity does not lose the right to consent or refuse therapy. Rather, the right is transferred to a surrogate decision maker to consent or refuse on behalf of the patient. Thus, the physician must initiate the same dialogue of consent with the surrogate of an incompetent patient as with the competent patient, and obtain consent for treatment

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from the surrogate on behalf of the incompetent patient.

In adult medicine, the surrogate may have been appointed formally or informally. Formal, legal surrogacy appointments include those performed under advance directives, such as the durable power of attorney for health care or health care agent statutes present in most states.[3] Citizens of these states have the right to formally appoint a legal surrogate whose authority becomes activated by the incapacity of the patient. Many states also have enacted health care proxy laws that automatically name a legally authorized surrogate from a statutory priority list of close relatives, in the absence of a prior directive.[6] Chronically incapacitated persons also may have been granted guardians by state agencies, who have legal authority to make medical decisions on behalf of the patient.

Informal surrogate decision-making is practiced widely in circumstances in which there has not been a previous formal legal appointment. In these situations, the nuclear family is permitted to consent or refuse on behalf of the patient. Although this process lacks strict legal authority, it is conducted successfully in practice so long as the family is united in opinion and the physician believes they are representing the patient's best interest. If there is a disagreement among family members or evidence of nonaltruistic decision-making, the physician should consider asking a court to appoint a legally authorized surrogate.

The process of medical surrogate decision-making follows established standards. The standards were enumerated first as legal doctrines, but clearly they were based implicitly on ethical grounds. The highest standard is the standard of expressed wishes. Surrogates should strive to follow any specific previously expressed wishes that pertain to a particular clinical situation because doing so maximally respects the self-determination of the patient whom they represent. However, experienced clinicians are aware that this standard rarely can be applied in practice because most patients could not have anticipated the exact clinical circumstances in which they would later find themselves.

When the standard of expressed wishes cannot be followed, surrogates should follow the standard of substituted judgment. By this standard, the surrogate should attempt to reproduce the decision that the patient would have made in this situation by applying the patient's value system to the specific clinical circumstance. The surrogate should be told that the decision to consent or refuse is not solely his or hers; the surrogate's task is simply to make the decision that the patient would have made. Successfully deciding by a standard of substituted judgment satisfies respecting patient self-determination.[3]

Successfully executing substituted judgment requires knowledge of the patient's value system and the courage to uphold it. But many surrogates appointed by courts or state agencies cannot know the wishes of the patients whom they represent and thus are forced to decide on the basis of their perception of the best interests of the patient. The best interest standard ethically is weaker than the above two standards because it does not follow the patient's expressed or presumed wishes. Rather, it requires the surrogate to perform a value judgment on the surrogate's perceived benefits of treatment compared with the perceived burdens to the patient. The ethical weakness stems from a third party making such a value judgment.[3]

Informed Consent in Pediatrics

In pediatric practice, society grants parents the authority to serve as surrogates to make medical decisions on behalf of their children. This role is part of the broader authority society grants parents to raise children in the way they believe is best for their children and that best represents their interests.[7] The details of parental surrogate authority show how the analogy of a child to an incompetent patient is an incorrect basis for this appointment.

A uniform standard for consent in pediatric practice is impossible because the age range of the patients varies from obviously incompetent infants to obvious competent late adolescents, encompassing all variations in between. Infants and preschool children comprise the class of "never-competent" patients. Not only are they incapable of making decisions, but their wishes cannot be known by their parents to permit a substituted judgment determination. Therefore, the best interest standard must be applied routinely to this group. Parents decide what is in the best interest of their children by conducting an analysis of benefits vs. burdens. They consider if the pain, suffering, and other evils imposed on the child by the treatment are justified by the expected benefits to the child. Their decision is made in conjunction with the child's physician, who provides information, recommendations, and guidance.

The school-aged child begins the development of cognitive capacities necessary to understand health issues, medical care, and the implication of decisions made now about future events. These capacities include abstract reasoning, inductive and deductive logical processes, and cognitive complexity. In their study of cognitive development in children, one group concluded that independent consent by minors younger than age 11 was not feasible, that consent by minors older than age 15 was feasible, and that ages 11-15 years represented an intermediate zone.[8] Similar findings were reported by other authors.[9,10] Thus, by age 14 or 15 years, most patients have achieved the requisite cognitive capacity to make independent, rational medical decisions.

Faced with a consent issue in an adolescent, the essential question is the clinical assessment of capacity to make health care decisions. Clearly age alone is an inadequate criterion because of the great variation in cognitive development at any given age. One group provided guidelines for assessing decision-making capacity in adolescents.[11] They suggested that physicians should individualize each determination and consider four interrelated factors: reasoning, understanding, voluntariness, and the nature of the decision to be made. They suggested a graduated program of involvement of children

and adolescents in decision-making about their medical care as a consequence of the capacities they demonstrate in each of these four categories.

Assent and Dissent

The most sweeping policy of organized pediatrics regulating consent in minors was the 1995 report of the American Academy of Pediatrics (AAP) Committee on Bioethics entitled "Informed consent, parental permission, and assent in pediatric practice."[12] This report explained the new concepts of "assent" and "dissent" of minors and clarified their distinction with consent and refusal in adults. The AAP stated that, to the greatest extent feasible, decision-making involving older children and adolescents should include the assent of the patient in addition to participation by the parents and physician. A minor's assent for testing or treatment should include at least the following elements:

1. Helping the patient achieve a developmentally appropriate awareness of the nature of his or her condition;
2. Telling the patient what he or she can expect with tests and treatment(s);
3. Making a clinical assessment of the patient's understanding of the situation and the factors influencing how he or she is responding (including whether there is appropriate pressure to accept testing or therapy); and
4. Soliciting an expression of the patient's willingness to accept the proposed care.

Regarding the final point, no one should solicit a patient's views without intending to weigh them seriously. In situations in which the patient will have to receive medical care despite his or her objection, the patient should be told that fact and should not be deceived.

The document clarified that assent of the "developmentally appropriate" child or adolescent was a necessary but insufficient condition for valid consent; the permission of the parents also was legally and ethically necessary. They were clear to use the term "parental permission" and not "parental consent" to underscore that parental permission alone was insufficient for valid consent. The document also defined the term "dissent" as the refusal of assent by the older child or adolescent. They stated that, despite permission of the family, when faced with a dissent from the older child or adolescent, medical personnel should withhold the treatment in question until interventions convince the patient to assent. Coercion should be reserved only as a last resort because it diminishes the moral status of children.[12]

Consent for Emergency Treatment

The principal exception to informed consent requirements surrounds treatment in medical emergencies when, because of time and availability, it may not be feasible for physicians to obtain consent. In these cases, if physicians plan to provide the generally accepted therapy for the emergency condition in question, the emergency treatment doctrine permits physicians to provide treatment on the basis of presumed consent.[13] In a review of 30 years of emergency medical treatment, the absence of consent did not constitute the basis for any legal judgment against a physician.[14]

The law always implies consent for treatment of a child in the event of an emergency. A child's life and health should never be compromised by a delay in an attempt to obtain consent. Parental consent is not needed; it is assumed. When time permits, attempts can and should be made to obtain consent by telephone. The medical record should reflect all attempts, including those that are unsuccessful.

This notion of implied consent in an emergency is an exception to the general consent requirement. Two criteria must be met before it applies. First, the patient must lack competence to make decisions independently. The minor child is deemed incompetent as a matter of law; thus, the first criterion is established.

Second, an emergency must exist. The definition of "emergency" has not been determined or agreed upon by all courts. Clearly, an emergency exists when immediate treatment is necessary to preserve a patient's life or to prevent permanent disability. Similarly, immediate treatment to alleviate pain and suffering has been deemed an emergency.[13] When both criteria are met, care may be provided.

Recently, many states have broadened the definition of "emergency." Most states have case law or legislation providing a basis for treatment without parental consent when "prompt" treatment is necessary. The harm resulting from an "emergency" may be severe or slight. The physician need not be certain as to the actual eventuality of harm, but only that harm or injury is a reasonable possibility.[13] Thus, the emergency physician has broad discretion in this area. Generally, if the delay for the purpose of obtaining consent could adversely affect the child, the physician should initiate evaluation and management under the emergency exception to the consent requirement.

The AAP Committee on Pediatric Emergency Medicine, in a position paper on consent for emergency services for children and adolescents, has made a number of further practical recommendations regarding consent in emergency situations.[15]

These recommendations admonish pediatricians to become familiar with applicable laws, urge emergency departments (EDs) to develop policies regarding presumed consent, recommend good documentation, and suggest that schools and other caretakers maintain health records and signed consents for emergency treatment. Furthermore, they urge schools to follow the AAP policy statement "Guidelines for Urgent Care in Schools," to remove all barriers to effective and timely treatment in emergencies, such as consent or payment issues, and suggest that other surrogates such as foster care families and state guardians develop policies for consenting to emergency medical care.[15,16]

Consent by Minors

The legal age defining a minor in most states in the United States has been lowered over the past three decades as a result

of the passage of the 26th Amendment to the Constitution in 1971, which lowered the voting age from 21 years to 18 years. Most states have changed their statutory definition of majority to 18 years for most rights, with the exception of the right to purchase alcoholic beverages.[3,17] Additionally, most states also have created special legal categories for minors who fulfill certain criteria of independence from their parents that permit them rights in excess of their more dependent peers. Legal categories, such as "emancipated minors" and "mature minors," have been so designated by many states.[17,18]

Emancipated minors are designated in many jurisdictions as minors viewed by law to be independent because of marriage, pregnancy, parenthood, military service, attending college, financial independence, disownment, or a judicial writ of emancipation. A number of states have enacted specific statutes granting emancipated minors the full right of consent for medical care. Most states recognize mature minors as those with the capacity to make health care decisions, whether or not they are emancipated. In these jurisdictions, adolescents of at least 14 years of age, who have the capacity to understand the nature of the proposed treatment and its risks, are permitted independent authority to consent if the medical treatment is of low risk.

Many states have enacted minor treatment statutes to clarify those situations in which parental consent is necessary and those in which it is not. Most minor treatment statutes permit adolescents older than age 14 to consent independently for treatment of pregnancy, birth control, sexually transmitted diseases, drug abuse, and alcohol abuse.[18] Some states include abortion and treatment of psychiatric disorders in their minor treatment statutes. Obviously, it is essential for practicing physicians to be familiar with the relevant provisions of the statutes in the states in which they practice.

Although many states have enacted statutes for consent by minors for medical treatment, most do not have specific provisions for terminally ill minors independently to refuse life-sustaining therapy that they do not wish to receive. Despite the fact that nearly all jurisdictions have statutory provisions for the living will and durable power of attorney for health care (or other equivalent surrogate legislation), most do not address end-of-life issues by mature minors.[19,20] Similarly, only a few high courts have ruled in cases permitting terminally ill mature minors the right to terminate life-sustaining therapy. One group advocates for a change in the law permitting mature minors to execute legal advance directives.[19]

A major unresolved issue is how to handle conflicts of consent and refusal of treatment between parents and children. The most common, serious conflict arises between the parents of a chronically ill or terminally ill older child or adolescent who wish continued treatment but the minor patient does not. Poignant reports have been published of terminally ill adolescents who chose to run away from home rather than face continued heroic treatment that they had unsuccessfully tried to refuse.[21]

Advance Directives in Pediatrics

Many adolescents with chronic medical conditions want to participate in the treatment decisions, especially decisions about life-sustaining medical interventions. Such chronic medical conditions often worsen over time (e.g., certain kinds to cancer, neuromuscular diseases, cystic fibrosis, acquired immunodeficiency syndrome, complicated types of heart disease). Having experienced years of physical and psychological suffering, multiple hospitalizations and numerous treatments, probably depression, and likely the deaths of several hospitalized friends with similar medical problems, these adolescent patients frequently are mature beyond their chronological years. They have had, at the very least, multiple opportunities to think about the inescapable anguish that characterizes their lives, the features of life that make it worth continuing, the benefits and challenges that accompany medical treatment, and prospect of death. At least some of these adolescents want to give voice to their values; provide directions for parents, physicians, and nurses regarding end-of-life care; and be assured that their wishes and preferences will be respected and carried out should their medical conditions deteriorate to the point that they will no longer be able to communicate their deeply felt views.

Advance directives, which were developed for this very purpose in adults, can help meet this goal for pediatric patients with chronic conditions. Enabling adolescent patients to communicate their wishes about treatment options through oral or written advance directives can provide ethical justification for such decisions, which should then provide a measure of legal protection of physicians.[20] Pediatricians, family physicians, and others caring for such patients would be able to document the specific end-of-life treatment wishes of these patients and their conversations about the use or nonuse of life-sustaining treatment that had taken place with the patients and their parents. Though no jurisdiction gives statutory authority for minors to complete written advance directives, the unique situation of chronic care makes them important ethical tools to be considered by professional caregivers.

Overriding Parental Refusal of Treatment

Cases arise occasionally in which the patient is clearly too young to consent or refuse treatment but whose parents refuse life-sustaining therapies or curative therapies against strong recommendations of the physician. Some parents are motivated by compassion and strive to minimize any pain or suffering of their children. Other parents have unconventional ideas about treatment and insist on alternative treatments rather than scientific treatments, because they believe the alternative treatments are safer, more natural, and even more effective.[3] Finally, some parents claim their religious beliefs preclude permitting appropriate medical treatment of their children. The religious issues are most difficult and often require judicial review or other external intervention.[22,23]

Parents or guardians who place their children at serious risks, for example, by refusing to permit a clinician to provide life-saving interventions to a child, may have their authority contested.[13,23] Guardians have the authority to give consent because it is presumed they will promote the opportunities and well-being of their children. If they harm or endanger their minor children or do not take adequate means to prevent or minimize harms to them, however, clinicians should challenge parental authority. Guardians may lose custody of their children temporarily or permanently if they neglect, abuse, or exploit their children. Courts can order interventions if the child is assessed to be in danger in their care. It is not only health care professionals who have a responsibility to protect children from abuse and neglect, but also teachers, neighbors, or others in the community. Clinicians, however, often have special insights into how children are being treated, and thus, special responsibilities to notify the authorities when parental acts or omissions endanger their minor children.

Some older children refuse important interventions because they object to the results. Clinicians and parents may have a duty to override their wishes, although, as noted, their inappropriate requests should initiate support for the minor and discussions about why their wishes cannot be controlling.

Inappropriate Care Requests

Parents sometimes ask clinicians to provide treatments, which the physicians regard as entirely unreasonable, such as herbal medicines for the treatment of cancer, antibiotics for viral illnesses, or highly invasive procedures for minor illnesses. In some case, parents and others confuse their right to refuse treatment they do not regard as beneficial with a belief they have a right to demand certain treatments. Clinicians have a duty to refuse such requests that may harm based on the moral principle of nonmaleficence. In addition, they have a social duty to conserve resources and not provide costly, futile or burdensome interventions. Simply put, futile treatments are not useful or useful enough to justify the expense, potential harms, time, or energy.[25-27]

As a matter of professional integrity and personal morality, clinicians should refuse to provide costly, burdensome or useless interventions. The question of when treatments are futile may of course be disputed among families or among clinicians.

Minors also sometimes may make demands that are not appropriate. If an adolescent demands genetic testing for a late-onset illness such as Alzheimer's disease, his preference should not prevail as it might for an adult since he may not have the maturity to consider his well-being and opportunities. Clinicians may have to override such inappropriate requests. They do not have a duty to provide medical interventions they regard to be wrong, ill-considered, or inappropriate.

Most, but not all, requests for futile interventions may be the result of miscommunication. Some of these are embedded in social, ethnic, or religious differences. In some cases, families have unrealistic expectations, believe "everything" must be done, or are waiting for a miracle. Guilt and denial also may play a role in these irrational or unreasonable requests. Clinicians should show great sensitivity and patience in helping families come to terms with a diagnosis or a prognosis. In some cases, families have a general mistrust of the health care system, which seems vindicated by an unexpected and bleak prognosis. Their request for futile treatment may be an expression of this mistrust. It is sometimes helpful to include someone whom they trust and can help them understand, such as a minister or family member with a health care background. In rare cases, the disagreement is truly a value disagreement where family members may, for example, see maintaining someone in a persistent vegetative state as a positive value while the clinicians do not. In these and other cases, doctors should maintain professional integrity and personal morality, but may find other clinicians willing to accept the families' decisions. Substantial literature exists on how to respond to futile situations, when to override parental requests, and the dangers of using decisions about what treatments are futile as a mechanism for rationing health care.[26-28] In general, however, for the practicing clinician, it is important to remember that most demands for futile interventions are likely to be the result of poor communication and inadequate understanding.

ED Utilization by Adolescents

Although EDs are used mostly for the treatment of illness or injury, they are used by many adolescents as a source of primary care.[29-33] Nationally, as many as 1.5 million adolescents ages 10-18 years reported having no usual source of health care other than the ED.[29,33] These adolescents were more likely to live in rural areas, be African American or male, and have fewer financial resources.[29,31] Most troubling, these adolescents were much more likely to report engaging in risky behaviors such as alcohol and drug use, and almost twice as likely to report a history of abuse.[29,31]

Although increased use of drugs and alcohol puts adolescents at risk for serious injury and illness, ED visits rarely allow for the comprehensive counseling or follow-up necessary to effectively address these behaviors. In addition, the higher rate of sexual and physical abuse reported by adolescents who use the ED as their usual source of care suggests that many ED users have serious physical and psychological health needs that have not otherwise been met. Without intervention, these high-risk adolescents are more likely to become adults with poor health, addictions, and psychological distress.[29]

Study of adolescent ED utilization suggests that many ED visits are for non-urgent complaints.[30-33] The National Hospital Ambulatory Medical Care Survey of adolescent ED utilization found that approximately one-half of ED visits were non-urgent.[31] Unfortunately, a high percentage of these adolescent patients are not referred for follow-up care upon discharge from the ED.[30] Follow-up with a primary care provider may

help these patients establish a source of routine health care and define guidelines for health care access. Data suggest that a high percentage (up to 76%) of patients comply with the follow-up recommendations.[34]

Many of the discharge categories for adolescents using the ED and a high percentage of hospitalized patients included adolescents with chronic conditions.[30,31] More than 30% of children in the United States younger than 18 years have one or more chronic health conditions.[35] During emergency situations, these children and their families need access to health care providers with knowledge of the child's condition, and they need collaboration among providers to manage the situation effectively.[36] Unfortunately, children with chronic conditions may have unmet health care needs and their care frequently is fragmented and poorly coordinated.[36-39]

It is necessary for emergency medicine physicians to question adolescents about their usual source of care and provide referrals to health centers, physicians' offices, or clinics that are more likely to provide longitudinal care, which is less costly.[29] The American College of Emergency Physicians (ACEP) recommends that an appropriate health care professional be identified to provide follow-up care to patients after they are discharged.[40] A system for integrating disenfranchised youth into the current system of primary care must be a priority. Only then will adolescents and health care providers shift from a model of crisis intervention to one of anticipatory guidance, screening, and primary prevention. Many guidelines for providing care to adolescents recommend that every adolescent should have an annual preventive care visit, including counseling and screening about risky and healthy behaviors.[29,41] The AAP believes that the medical care of infants, children, and adolescents ideally should be accessible, continuous, comprehensive, family centered, coordinated, compassionate, and culturally effective. It should be delivered or directed by well-trained physicians who provide primary care and help to manage and facilitate essentially all aspects of pediatric care. The physician should be known to the child and family and should be able to develop a partnership of mutual responsibility and trust with them. These characteristics define the "medical home."[42]

Confidentiality

The importance of confidentiality in medical practice has been acknowledged since ancient times.[25,43] One reason for this is that respecting patients' confidentiality generally promotes the moral principle of beneficence or their best interests. If patients are assured of confidentiality, they are more likely to be candid. Moreover, since privacy is what each of us wants for ourselves, then it is only just to extend it to others. In addition, it is fair to adopt this policy of respecting confidentiality since, in some sense, patients "own" the information about themselves and confidentiality honors their privacy and rights to control this information. If some information about the individual is released, such as a genotype for a late onset genetic disease, it has the potential to cause great harm through discrimination, labeling, or loss of self-esteem.[25] The social utility of respecting patients' confidentiality also is acknowledged in policies allowing physicians to avoid testifying about patients' revelations to them in health care settings. Confidentiality may be important for minors as well as adults. Minors, for example, may seek medical care as a safe haven to express how they have been abused or exploited. Adolescents are more likely to seek health care and to disclose personal information when they believe that the information will be kept confidential.[17,44]

The clinician's duty to maintain confidentiality, however, is not absolute. The resumption in favor of confidentiality can be overruled if there is greater value at stake or if there is a recognized exception. For example, an exception to the duty to maintain confidentiality is to protect a third party, as in child abuse. If clinicians suspect that someone is abusing a child, they have a legal and moral duty to override confidentiality because a greater value is at stake. In addition, there may be a duty to override confidentiality if there is a need to protect the patient from himself or herself; there may be such a duty if the minor is suicidal. In addition, there may be a duty to protect the community that is greater than the duty to maintain someone's confidentiality, such as a duty to report communicable diseases or gunshot wounds, whether or not the patient wants them to be reported.

When trying to decide whether the duty to maintain confidentiality is the greater duty or not, certain features must be considered. The first is that in making the judgment about whether to overrule confidentiality one must consider the severity of the harm to be avoided and the probability of its occurrence. If there were a very small risk of a minor harm, the duty to maintain confidentiality would be secure. As the harm is greater and the likelihood higher, the duty to override confidentiality increases. Second, the most justifiable cases of overriding the duty of confidentiality for adults who are competent generally are to prevent harms, especially to third parties; this honors the principle of nonmaleficence. The duty to prevent harm generally is recognized as stronger than the duty of beneficence, since our notion of what we think benefits competent adults may be wrong, and acting on such impulses may be disrespectful of their autonomy. Clinicians would have, for example, a strong duty to override a competent parents' confidentiality to prevent harm to a child who is endangered in the parents' care.

Respect for children's rights of confidentiality cannot be approached in the same way of those of fully competent adults. While their wishes and values are important, the best interest standard of the child shapes decision-making for children and thus is the primary consideration. Yet older children may have rights to privacy independent of their parents. In some cases clinicians may have a legal right to refuse to discuss with guardians intervention for the minor's substance abuse, sexually transmitted disease, abortion, or contraception. In addition, it may be in the best interest of children or adolescents who are abused, neglected, or exploited, to be

able to seek help without parental consent or involvement. Clinicians, of course, should explore the minor's reasons for not wishing to involve parents. Sometimes the child's concerns are not realistic, but in other cases the minor knows that parents would refuse to permit some interventions, such as allowing the provision of contraception. Since only one view can prevail where parents and children disagree, it is sometimes morally and legally justifiable to respect the child's preference not to involve his or her parents.

Family Presence During Invasive Procedures and Resuscitation

The concept of allowing families in the treatment area during invasive procedures and resuscitation is rapidly growing and receiving more attention and acceptance.[45-47] Health care organizations that traditionally have been bound by the practice of family exclusion are now being challenged by the increasing volume of research and public attention surrounding the family presence movement. Allowing family members to be present validates the unique personhood of the patient while recognizing his integral position within a larger family unit. The documented benefits have exceeded the perceived risks for families permitted to be present during resuscitation.[45] Families and patients view family presence during resuscitation as a right. In addition, health care providers who initially resisted permitting families to attend resuscitation now are conceding to families this opportunity which, not surprisingly, is one that they would choose for themselves.

The family presence program will continue to evolve as new research is conducted and variables are examined to assess their impact on patients, families and health care providers. With increased knowledge and awareness of the benefits and limitations of family presence, the practice of allowing families in to comfort and support loved ones at the end of life can only enhance and strengthen the bond between patients and health care providers. Parents or family members often fail to ask if they can be present, but health care providers should offer the opportunity.[45,48] When family members are present during an in-hospital resuscitation, one health care provider should remain with the family to answer questions, clarify information, and offer comfort.[45]

Termination of Resuscitation Efforts

Most children who experience a cardiac arrest will not survive. If a child fails to respond to at least two doses of epinephrine with a return of spontaneous circulation, the child is unlikely to survive.[49,50] Current literature suggests that ED physicians often prolong resuscitation in a child much longer than they would in an adult and often beyond all hope of survival.[51-55] Fear of breaking the news of the child's death to the family is a common reason for prolonging resuscitation efforts in hopeless situations. This is a difficult and stressful task for physicians and, unfortunately, physicians receive little training for it.[51] Several authors have described methods for teaching this skill to students and residents.[51,54,55]

Recommendations include breaking the news in a private room (if family members were not present for the resuscitation), briefly preparing oneself prior to entering the room (know the child's name and what happened), and do not keep the family waiting. Once one enters the room, identify oneself, address both parents, use the patient's name, and give a brief chronology of what has happened. Let them know everything was done, and if possible, that the child felt no pain. Many experts advise issuing a "warning shot," such as "I'm afraid I have bad news," prior to stating that the child has died.[51] It is important to use the word "died" and not a euphemism. Reassure the family that it is not their fault and that they acted correctly. After telling the parents that their child has died, one should allow for an initial grief response. Things not to do include standing when delivering the news, referring to "the baby" or "it," using euphemisms or jargon, implying blame, sealing off the grief response, or forgetting other family members. Parents remember how the news was delivered better than any details of the treatment.[51] They want to know that their child was cared for by someone both competent and caring.

After one has broken the news of a child's death, giving the family the opportunity to view the child's body (if they were not present for the resuscitation) is suggested by all experts. Follow-up contact should include giving the family the name and number of a staff member to contact with questions, contacting the patient's primary care doctor and providing information on support groups. A follow-up phone call or letter from an ED staff member also can be helpful. The formation of a team in the ED to assist in handling these difficult events has been advocated by experts and found to be helpful to families.[51,56]

Relief of Pain and Suffering

Patients present to the ED with pain from a wide range of causes. Procedures that can cause pain and significant anxiety often are necessary during emergency care of children. These procedures are stressful for children, their parents, and their health care providers. Furthermore, inadequately treated pain produces physiologic and psychologic reactions that have acute and long-term consequences.[57] The duty of physicians to relieve pain and suffering should be considered one of the highest obligations.[58]

Advantages of safe and effective management of pain and anxiety in the ED include facilitation of controlled accomplishment of evaluations and procedures, reduction of psychological trauma and its sequelae, reduction of stress for the health care provider and parents, improvement of parental acceptance of rendered care, and possibly, improvement of accurate evaluation of causes of pain. Unfortunately, it is well recognized that many patients do not receive adequte analgesia while in the ED.[59] The Agency for Health Care Policy and Research has noted the inadequate treatment of pain by physicians and advocates for physicians to relieve pain and suffering in patients.[60] ACEP also has advocated for the adequate

use of sedation and analgesia in pediatric patients undergoing ED procedures.[61] The 2001 Joint Commission on Accreditation of Healthcare Organizations emphasizes the assessment and management of a patient's pain from the moment the patient enters the health care system through discharge.[62,63]

Although myths and barriers still exist regarding pediatric pain and pain management, there have been numerous research efforts to eradicate those misconceptions. It is now the responsibility of health care providers to educate themselves and their peers regarding the facts of pediatric pain management. It is encouraging to see health care organizations lead the effort to ensure that every pediatric patient has appropriate assessment and treatment of their pain. It is the health care community's obligation to ensure we are meeting and exceeding these standards. Organizations must assess their ability to meet these standards and develop a multidisciplinary approach to pediatric pain management.

As the art and science of pediatric pain management continues to develop, there are some guidelines for current practice.[62] They are as follows:

- All infants and children have the physiologic pathways necessary to experience pain.
- Health care providers must be knowledgeable of the behaviors infants and children exhibit to express pain.
- If parents are present, their opinion should be sought regarding their assessment of their child's pain.
- Pain should be assessed and documented at regular intervals using valid and reliable measurement tools.
- A variety of nonpharmacologic and pharmacologic treatments should be utilized to achieve maximum pain relief.
- Parents and, when developmentally appropriate, the child must be educated on the pain management plan.
- The health care provider must be aware of his or her own perceptions, beliefs, and values concerning pain and the influence these exert on his or her practice.

Considerable literature exists about the use of sedation and analgesia for procedures performed in the acute setting.[64,65] The goal of procedural sedation and analgesia is to match the patient and procedure with the most appropriate technique and agent that can provide the patient with the most humane and compassionate environment safely possible.[58] The ability to provide safe, effective procedural sedation and analgesia is a necessary skill for physicians caring for the acutely ill or injured pediatric patient.

Emergency medicine has made great strides in managing acute pain and anxiety. The goal should always be to minimize the pain and emotional distress experienced by children present in the ED. The fulfillment of this goal will be a lasting contribution to the health and well-being of children.

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Physician CME Questions

To earn CME credit for this issue of Emergency Medicine Specialty Reports, *please refer to the enclosed Scantron form for directions on taking the test and submitting your answers.*

1. Article 12 of the 1989 United Nations Convention on the Rights of the Child states that:
   A. all children capable of expressing views have the right to do so freely in all matters of concern to them.
   B. children's views on matters of concern to them must prevail.
   C. children have the right to express their views in all areas except in matters of medical care.
   D. children have the right to designate guardians to act on their behalf.

2. A patient's consent to a treatment or procedure becomes valid when:
   A. adequate information has been provided to the patient by the practitioner to permit a rational consent or refusal.
   B. the patient possesses the capacity to make medical decisions.
   C. the treatment consent or refusal is made freely, without coercion by persons or agencies.
   D. All of the above

3. When a minor is in immediate need of emergency medical treatment, the practitioner must wait to obtain parental consent before administering treatment.
   A. True
   B. False

4. When asked by parents to provide a pediatric patient with medical interventions the clinician regards to be wrong, ill-considered, or inappropriate, clinicians have a duty to comply.
   A. True
   B. False

5. In which example(s) is/are a patient's right to confidentiality outweighed by a clinician's duty to report?
   A. When the clinician suspects child abuse
   B. When the patient is suicidal
   C. When the patient has suffered a gunshot wound
   D. All of the above

Clinical trials harmed by lack of informed consent

The mention of clinical trials often triggers a silence between physician and patient, usually because neither one knows much about the subject. Nearly 80% of physicians admit they would like to know more about clinical trials so they can help their patients make an informed decision before volunteering to participate.

"Most subjects enrolled in clinical studies have a meager understanding of what they have gotten into," says Alan Sugar, MD, chairman, New England Institutional Review Board, Professor of Medicine, Boston University School of Medicine, Boston. "Informed consent has largely focused around the signed form and has not practically become the continuous process that it needs to be. As a result, a subject's misunderstandings largely go unchallenged."

Properly informing patients not only is ethically necessary, say clinical trials experts, but it also ensures better trials and data. Last year more than 17 million people thought seriously about participating, but only a few million actually completed their trials. And even among them many gave their consent without a thorough knowledge of the facts.

"There's a simple ethical mandate that you don't ordinarily do dangerous things to people without their knowledge and consent," says Dale E. Hammerschmidt, MD, FACP, associate professor of medicine and director of Education in Human Subjects' Protection for the University of Minnesota Medical School in Minneapolis. "From a more pragmatic perspective, a well-informed subject is likely to cooperate better with the trial and is more likely to report potential problems. The quality of the data and the safety of the trial are both enhanced when the subjects really know what's going on."

Indeed, patients can be so daunted by questions and lack of information that they simply decide not to volunteer.

A new resource, written for doctors and clinical trial participants, can help answer some of these tough questions. Boston-based CenterWatch, the leading publisher of clinical trial news and information, now offers "Informed Consent," a consumer's guide to the risks and benefits of volunteering for clinical trials. The book is a practical guide through the confusing world that patients perceive clinical trials to be.

"Informed Consent" is a step-by-step guide that begins with a history of the clinical trials industry, and explores the drug development process and how a new drug makes its way to the marketplace. The book goes into detail about why people decide to participate, how to find clinical trials, how to research clinical trials and evaluate their risks, how to ensure proper informed consent, who the vulnerable populations are, and what to do when things go wrong.

Cost is $16.95 and it can be ordered from CenterWatch at (800) 765-9647, or by faxing your request to (617) 856-5901. It can also be ordered through centerwatch.com, Amazon.com, and barnesandnoble.com.

6. A patient's signature on a written consent form constitutes informed consent.
   A. True
   B. False

7. The process of medical surrogate decision-making includes which of the following standards?
   A. The standard of expressed wishes
   B. The standard of substituted judgment
   C. The best interest standard
   D. All of the above

8. How many adolescents, ages 10-18, are believed to use the ED as their usual source of health care?
   A. as many as 1.5 million
   B. more than 3 million
   C. as many as 6 million
   D. more than 8 million

9. According to the National Hospital Ambulatory Medical Care Survey of adolescent ED utilization, three-quarters of adolescents' ED visits were urgent.
   A. True
   B. False

10. If a child in cardiac arrest fails to respond to at least two doses of epinephrine with a return of spontaneous circulation, he or she is unlikely to survive.
   A. True
   B. False

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