ACC/AHA Guidelines (In the 21st Century)

Helping Cardiovascular Professionals
Learn. Advance. Heal.

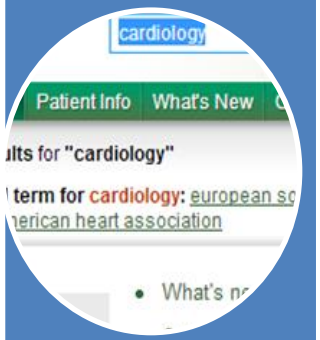
A 32 y/o woman just walked into your office who had a mechanical St Jude MVR 5 years ago. Her INR has been 3.0 on 3 mg warfarin per day. Guess what?

She is 8 weeks pregnant

Do you know what to do?

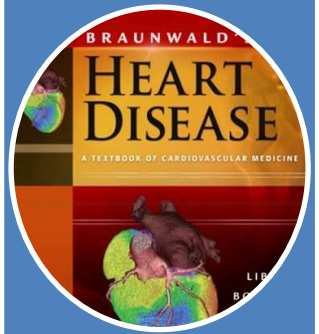
1. Continue warfarin
2. Switch to LMWH
3. Switch to subq UFH
4. I don't know

Where do we go for knowledge? - quickly

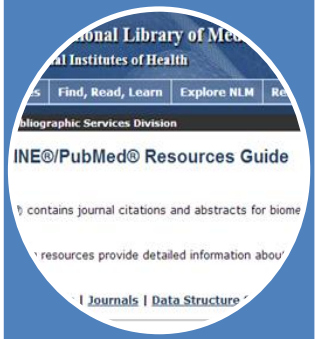


Up to Date

Google



Textbooks



Med-line

Call the expert

Helping Cardiovascular Professionals Learn. Advance. Heal.

ACC/AHA Practice Guidelines
The “flagship” of US cardiology

Evidence-based
Synthesis by our experts
Unbiased
Highly vetted

Helping Cardiovascula
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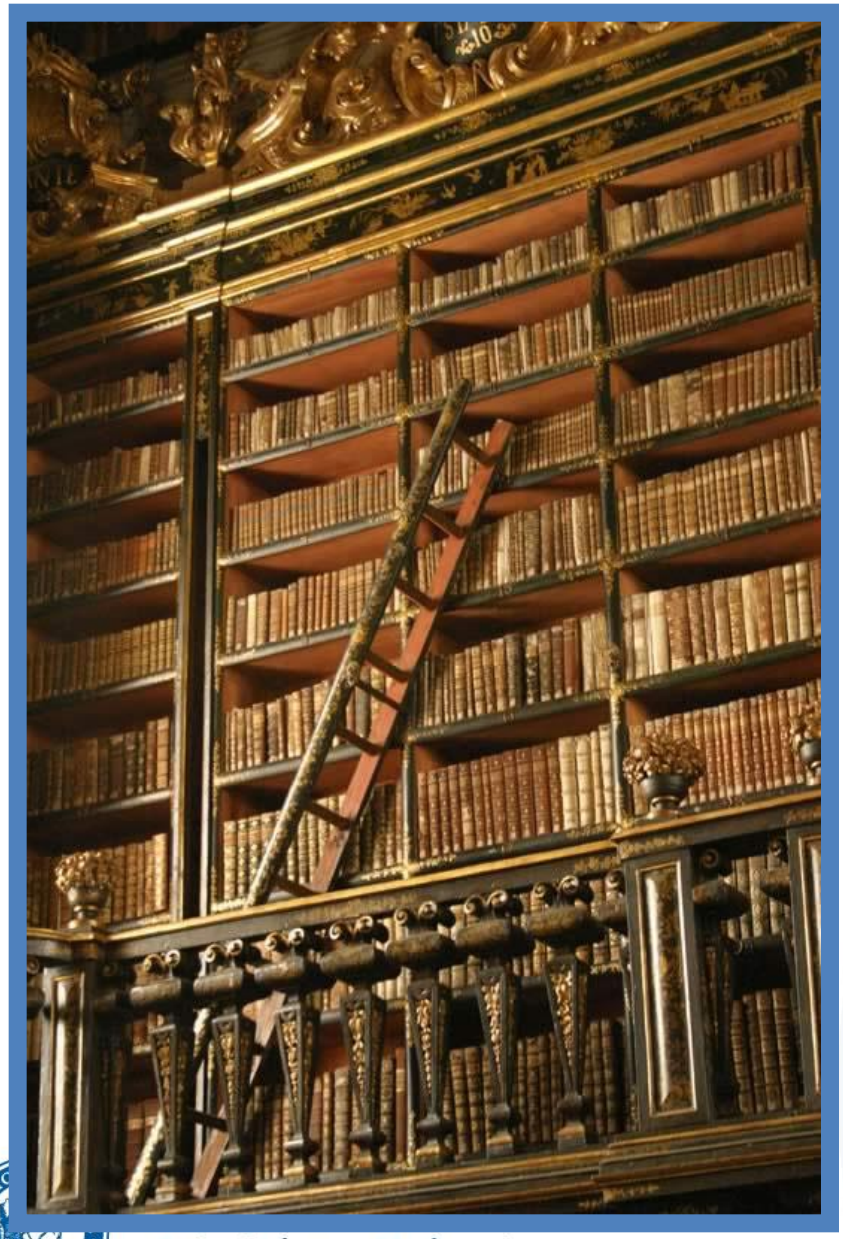

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ACC/AHA Practice Guideline

Journal of the American College of Cardiology
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Published by Elsevier Inc.

Vol. 52, No. 23, 2008
ISSN 0735-1097/08/$34.00
doi:10.1016/j.jacc.2008.10.001

PRACTICE GUIDELINE: FULL TEXT

ACC/AHA 2008 Guidelines for the Management of Adults With Congenital Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Develop Guidelines on the Management of Adults With Congenital Heart Disease)

Developed in Collaboration With the American Society of Echocardiography, Heart Rhythm Society, International Society for Adult Congenital Heart Disease, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons

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December 2, 2008:e143–263

TABLE OF CONTENTS

Still can't find what I need

procedure, only 45% of patients were free of neoaortic autograft dilatation, but 90% had an increase in autograft root dimensions greater than 25%. However, dilatation did not always necessitate reoperation for aneurysm formation or increasing AR (343), and the use of a subcoronary Ross procedure results in stable root dimensions (344,345).

6.7. Recommendations for Key Issues to Evaluate and Follow-Up

CLASS I

1. **Lifelong cardiology follow-up is recommended for all patients with aortic valve disease (AS or AR) (operated or unoperated; refer to Section 6.4, Recommendations for Evaluation of the Unoperated Patient). (*Level of Evidence: A*)**
2. **Serial imaging assessment of aortic root anatomy is recommended for all patients with BAV, regardless of severity. The frequency of imaging would depend on the size of the aorta at initial assessment: if less than 40 mm, it should be reimaged approximately every 2 years; if greater than or equal to 40 mm, it should be reimaged yearly or more often as progression of root dilation warrants or whenever there is a change in clinical symptoms or findings. (*Level of Evidence: B*)**
3. **Prepregnancy counseling is recommended for women with AS who are contemplating pregnancy. (*Level of Evidence: B*)**
4. **Patient referral to a pediatric cardiologist experienced in fetal echocardiography is indicated in the second trimester of pregnancy to search for cardiac defects in the fetus. (*Level of Evidence: C*)**
5. **Women with BAV and ascending aorta diameter greater than 4.5 cm should be counseled about the high risks of pregnancy. (*Level of Evidence: C*)**
6. **Patients with moderate to severe AS should be counseled against participation in competitive athletics and strenuous isometric exercise. (*Level of Evidence: B*)**
7. **Echocardiographic screening for the presence of BAV is recommended for first-degree relatives of patients with BAV. (*Level of Evidence: B*)**

Progressive or recurrent AS, AR, or aortic enlargement may occur in the presence of a BAV. Patients with or without intervention should be followed up at least yearly for symptoms and findings of progressive AS/AR ventricular dysfunction and arrhythmia. This includes resting and stress ECGs to look for ischemic changes or arrhythmia; echocardiography-Doppler to monitor LV size/volume and systolic and diastolic function, aortic valve function, and aortic root size and anatomy; and 24-hour ambulatory ECG monitoring.

With or without intervention, both AS and AR are progressive lesions that may ultimately require surgical intervention. Prosthetic valve complications include endocarditis, thrombosis, periprosthetic regurgitation with or without hemolysis, and obstruction related to pannus in growth. Patients who undergo the Ross procedure (placement of the native pulmo-

Patients who undergo the Bentall procedure (aortic root replacement with a composite valve and graft with coronary reimplantation) are also at risk for proximal coronary obstruction.

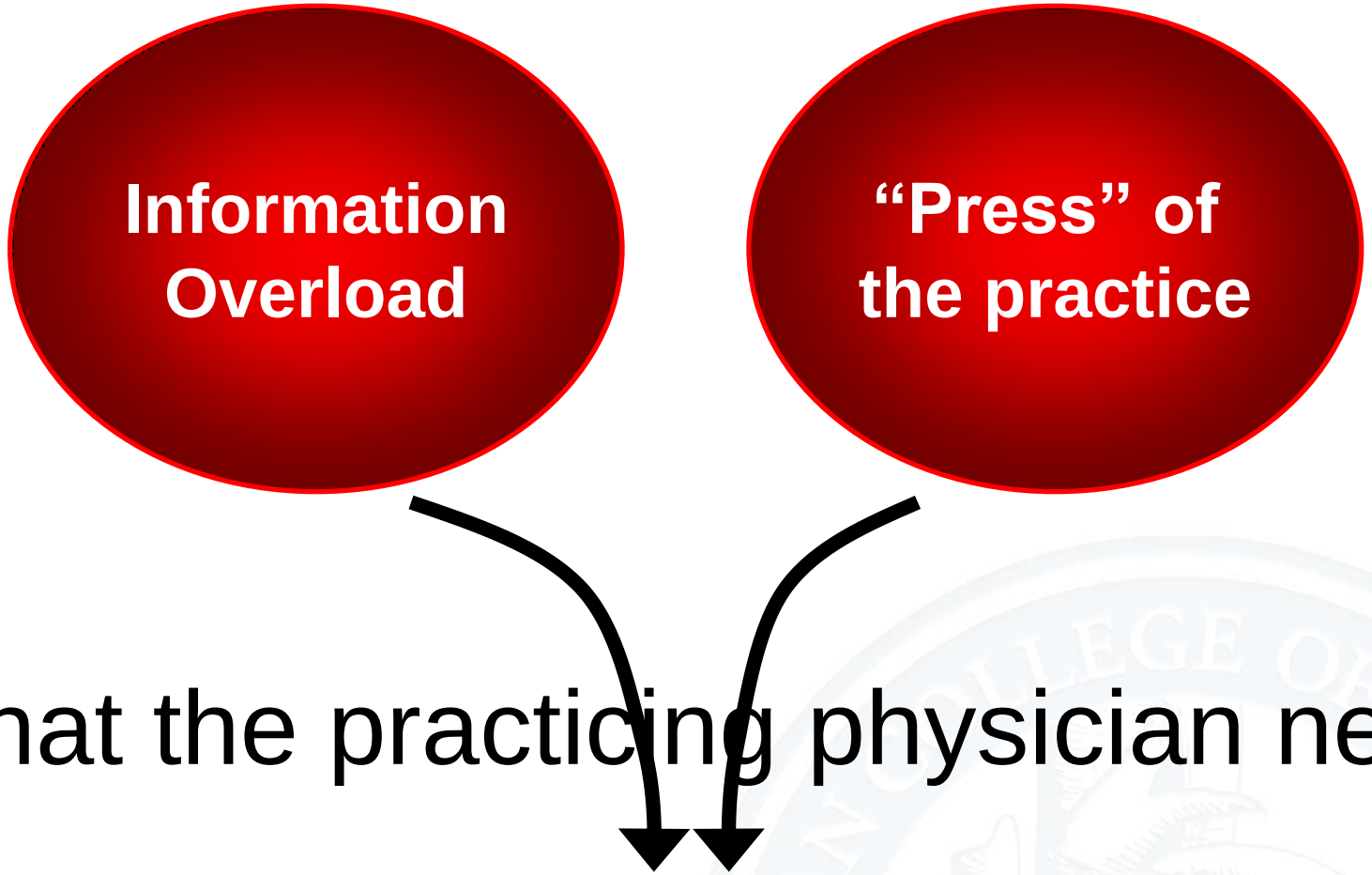
Congenital AS with a long-standing significant gradient can be associated with ventricular arrhythmias in adulthood, including the small possibility of sudden cardiac death (346). Patients should be monitored carefully for symptoms and should have regular ECGs, plus periodic ambulatory rhythm monitoring, to assist in early detection of arrhythmias (104,347).

6.7.1. Reproduction

Most pregnancies with congenital AS are uncomplicated, but in those with severe AS, morbidity is higher, although deaths are still rare (348,349). Prepregnancy counseling is recommended. Referral to a fetal cardiologist is indicated in the second trimester because there is an increased risk of transmitting CHD to offspring. Delivery in all but the mildest of cases may be best accomplished at centers experienced with high-risk heart disease. Vaginal delivery is generally preferable to cesarean delivery except in the presence of obstetric contraindications or severe cardiac situations, such as aortic aneurysm, dissection, or critical AS, or in women who are undergoing anticoagulation (because of the risks of intracranial bleeding in the newborn). Delivery may be performed under controlled circumstances at approximately 38 weeks (provided fetal lung maturity is deemed sufficient) with appropriate monitoring of maternal heart rate, blood pressure, and fetal monitoring. Even though the 2007 AHA Scientific Statement on Prevention of Infective Endocarditis does not recommend routine prophylaxis for vaginal delivery or cesarean section, many obstetricians administer antibiotics at the time of rupture of membranes for women with aortic valve disease (74) (refer to Section 1.6, Recommendations for Infective Endocarditis, for additional information). Prepregnancy or prenatal evaluation and counseling in women with congenital aortic valve disease is essential to explore options and manage risks. The role of balloon valvuloplasty in the palliation of symptomatic pregnant women with AS requires further study, but it may be applied successfully if symptoms are refractory to medical therapy (348,350). There is no evidence that pregnancy accelerates progression of congenital AS or AR. In some cases, the drop in systemic vascular resistance that accompanies pregnancy may reduce the regurgitant fraction in AR (351).

6.7.2. Activity/Exercise

Patients with moderate to severe AS who participate in competitive athletics risk sudden cardiac death, likely from arrhythmias; therefore, they should be strongly counseled against competitive athletics and strenuous isometric exercise. Patients with aortopathy should be similarly counseled about the risks of chest injury. Exercise and athletics have been addressed in the report of Task Force 2 on CHD of the 36th Bethesda Conference (49).



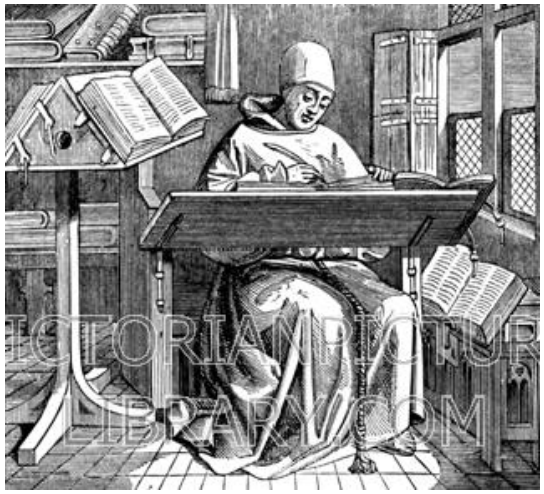
What the practicing physician needs

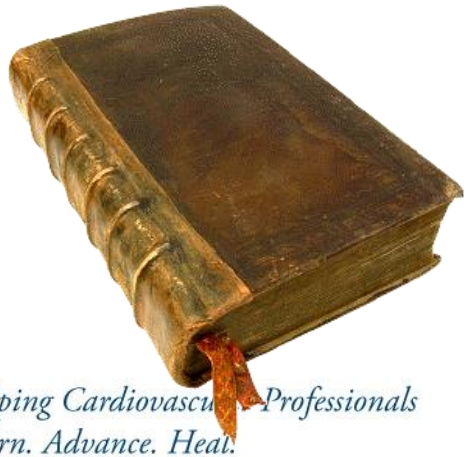
The "Gist"

Concise relevant bytes of knowledge that answer a specific question, synthesized by an expert(s)

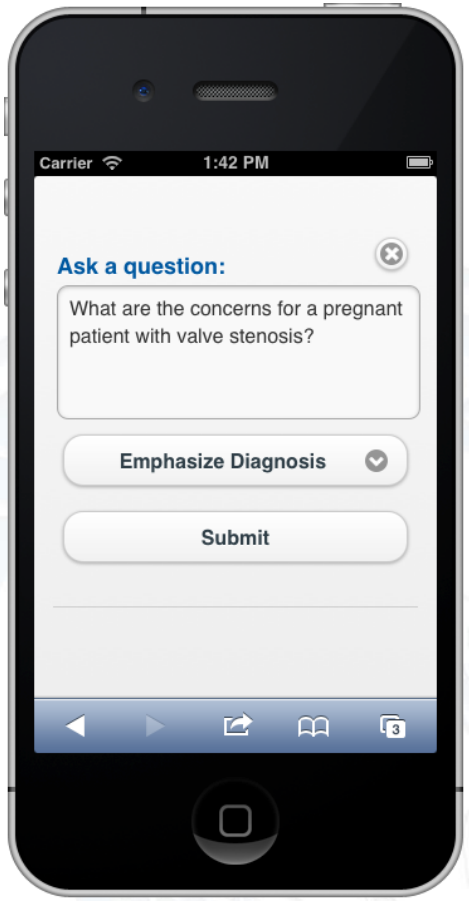
How do we take the incredibly valuable vetted knowledge of the guidelines and make them of optimal utility to cardiologists in the 21st century?

Unstructured text
Document interchange





Structured data
Knowledge Management



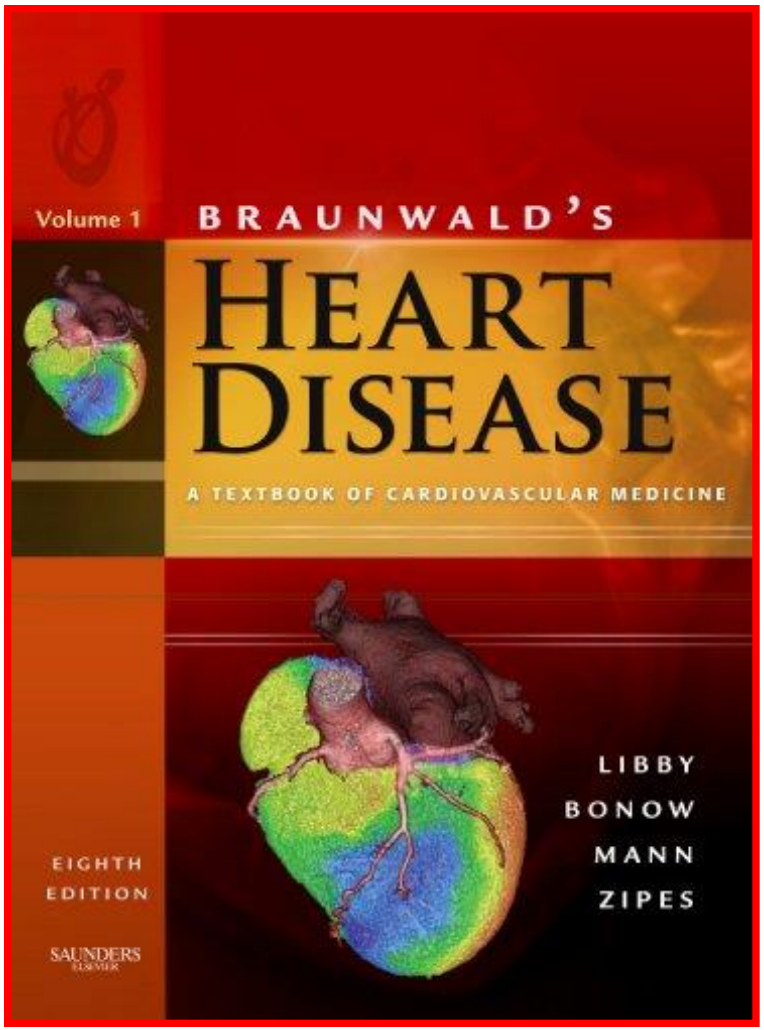
Write guidelines differently

Organize guidelines differently

Knowledge “chunks”

2014 ACC/AHA Valvular Heart Disease Guidelines

Create and organize knowledge content differently to meet the needs of the digital era



Textbook Writing
Academic Cardiologists

Introduction
Etiology
Pathology
Pathophysiology
Signs and Symptoms
EKG, CXR, lab testing
Noninvasive imaging
Invasive testing
Natural history
Medical therapy
Interventions
Surgery
Etc.

Create taxonomy
Based upon how clinicians think

Create taxonomy
Based upon how clinicians think

Create evidence tables
Based upon taxonomy

ata Supplement 25. Pregnancy and Prosthetic Valves Prior to LMWH (Section 12.3.2)

Study Name, Author, Year	Study Aim	Study Size (N)	Patient Population		Study Type	Type of Anticoagulation	Endpoints		Summary	Study Limitations
			Inclusion Criteria	*Exclusion Criteria*			*Maternal*	*Fetal*		
Chan, 2000 (201) 10647757	Systematic review anticoagulation mechanical valves	1,234 pregnancies in 976 women	All pts with mechanical prosthesis–40 articles–treated with differing anticoagulation regimens 1966–1997	N/A	Systematic review of literature	1. Warfarin throughout 2. UFH 1st trimester, then warfarin 3. UFH throughout pregnancy 4. No A/C	Maternal Death 1. 1.8% 2. 4.2% 3. 15% 4. 4.7% Thromboembolic 1. 3.9% 2. 9.2% 3. 33% 4. 24%	Fetal anomalies 1. 6.4% 2. 3.4% 3. 0% 4. 3.3% Fetal wastage 1. 33% 2. 26% 3. 43% 4. 20%	Reduction of thromboembolic events for mother greatest with warfarin throughout pregnancy, worse maternal outcome with heparin throughout pregnancy. Heparin in 1st trimester reduces risk of fetopathic effects, but with increased risk of thromboembolic embolic events.	Retrospective systematic review–prior to LMWH use
Meschengieser, 1999 (202) 10377303	Single center experience anticoagulation mechanical valves	92 pregnancies in 59 women	Consecutive unselected pregnancies between 1986–1997	N/A	Observational	1. Warfarin throughout pregnancy 2. UFH 1st trimester, then warfarin 3. UFH throughout pregnancy 4. No A/C	Thromboembolic 1. 0.3 episodes/100 pt mo 2. 4.9 episodes/100 pt mo	Fetal wastage 1. 25% 2. 19%	Reduction of thromboembolic events for mother greatest with warfarin throughout pregnancy. No maternal deaths or valve thrombosis occurred in this study.	Retrospective review of small number pts–prior to LMWH use
Vitale, 1999 (203) 10334435	Single center experience anticoagulation mechanical valves	58 pregnancies in 43 pts	Consecutive unselected pregnancies between 1987–1997	N/A	Observational	1. Warfarin throughout pregnancy A. Dose ≤5 mg vs. B. Dose >5 mg	Maternal Death None Valve thrombosis 2 pts	Fetal complications 1A. 4 SA and 1 GR (28/32 healthy babies) vs. 1B. 2 WE, 18 SA, 1 SB, 1 VSD (3/25 healthy babies)	First to show that fetal complications are dose-dependent, relatively safe if dose ≤5 mg	Retrospective review–only warfarin throughout was used
Salazar, 1996 (204) 8636556	Single center experience anticoagulation mechanical valves	40 pregnancies in 37 pts	Single center experience of a prospective protocol using UFH subq during the 1st trimester	N/A	Prospective cohort trial	All pts had subq UFH from 6–12 wk and then last 2 wk gestation	2 cases of massive thrombosis of a MVR tilting disk 1 death from GI bleeding during warfarin	37% spontaneous abortion 2.5% neonatal death No embryopathy	UFH is a poor anticoagulant and does not prevent massive thrombosis	Trial stopped after 2 events occurred
Sbarouni, 1994 (205) 8130033	Questionnaire to all cardiac centers in Europe	214 pregnancies in 182 pts (133 with mechanical	Questionnaire sent 1994 to all cardiac centers in Europe	N/A	Questionnaire data	N/A	6 maternal deaths (4 valve thrombosis, 1 cerebral embolism, 1 pulmonary edema) 13 valve thrombosis–10/13	No embryopathies in 36 women on warfarin Fetal outcome similar for warfarin vs.	Heparin is neither effective or safe for both fetus and mother with increased risk thromboembolism and bleeding	No detailed information on level of anticoagulation dose. Selection

Create taxonomy
Based upon how clinicians think

Create evidence tables
Based upon taxonomy

Create knowledge chunks
(concise, relevant, practical)
Based upon taxonomy and evidence

Class IIa: Continuation of warfarin during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin to achieve a therapeutic INR is less than or equal to 5 mg per day

Create taxonomy
Based upon how clinicians think

Create evidence tables
Based upon taxonomy

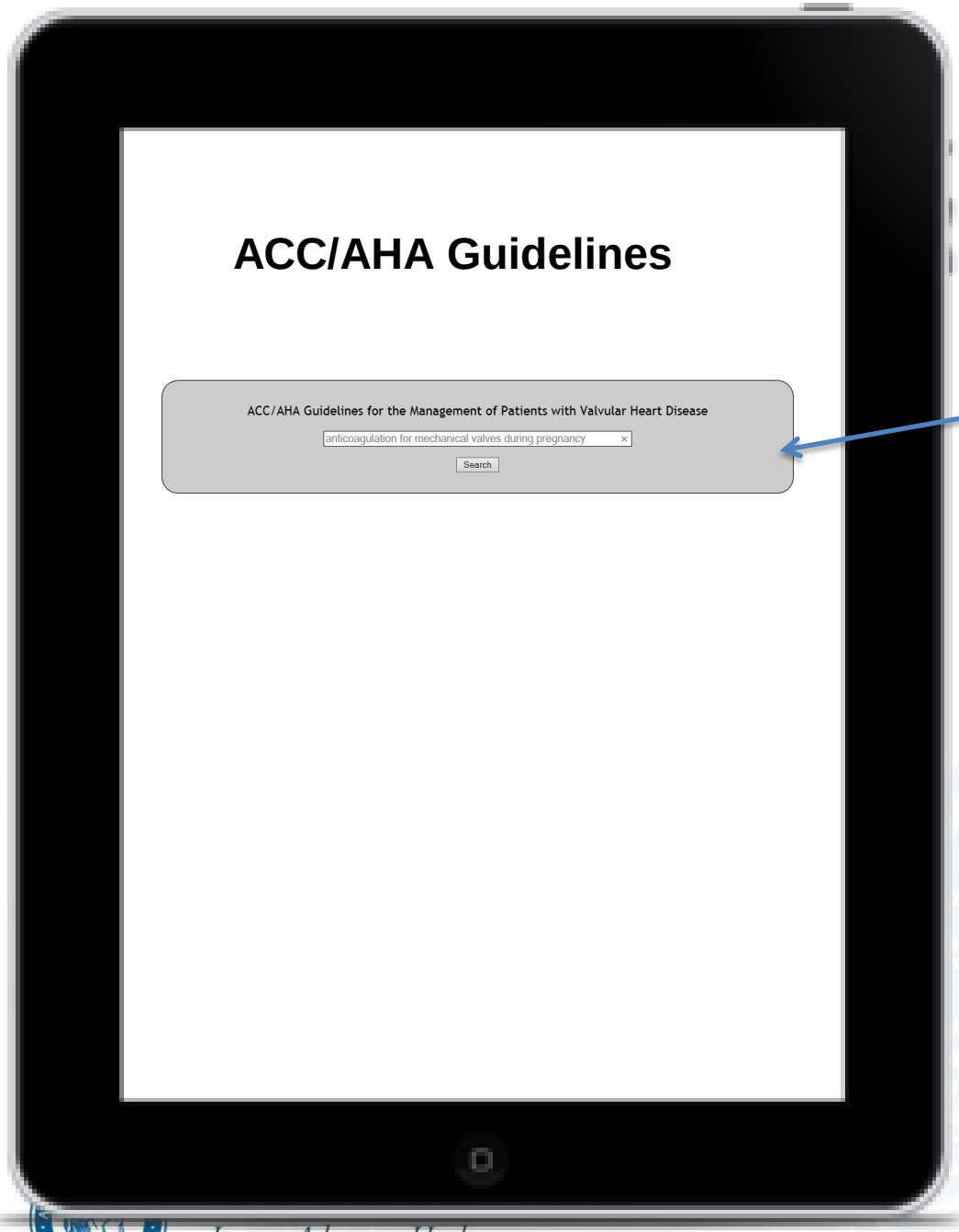
Create knowledge chunks
(concise, relevant, practical)
Based upon taxonomy and evidence

Supporting text for each chunk (concise)
Link to References
Link to Figures

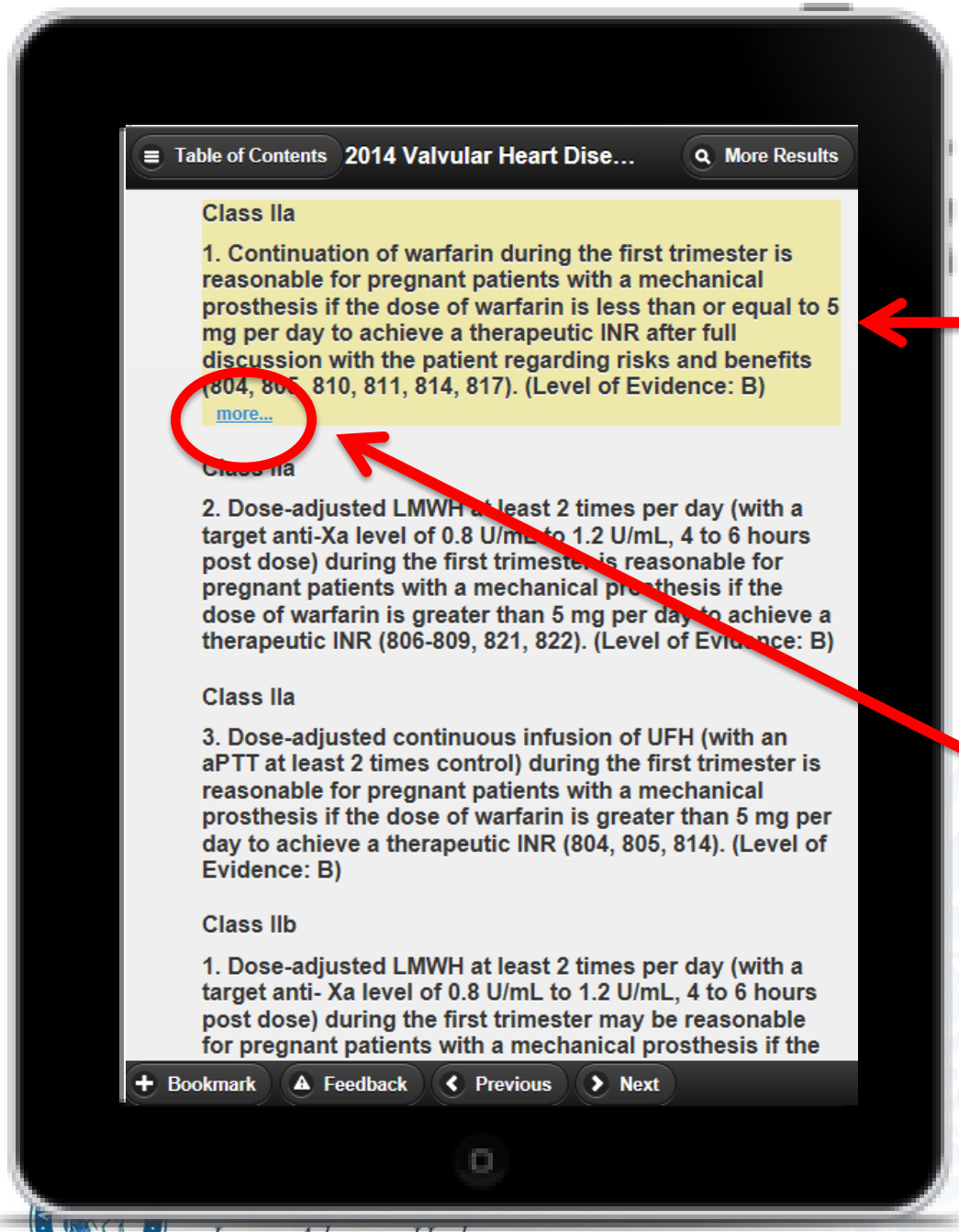
Class IIa: Continuation of warfarin during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin to achieve a therapeutic INR is less than or equal to 5 mg per day

The optimal anticoagulant used for pregnant patients with mechanical prosthetic valves during the first trimester remains controversial. Oral anticoagulation with warfarin is overall the safest regimen for the mother, but there is an increased risk of embryopathy. Anticoagulation with UFH or LMWH has been recommended to avoid the risk of embryopathy, but is not as effective as warfarin in preventing thromboembolic events. It has been shown that the risk of embryopathy is dose-dependent, with a low risk (<3%) if the dose of warfarin is ≤5 mg per day. The risk of abortion and fetal loss are increased with any anticoagulant regimen, but may be similar in women exposed to oral anticoagulants versus heparin in the first trimester, especially at low doses of warfarin. Continuation of warfarin during the first trimester is reasonable after a full discussion with the patient and family regarding the risks and benefits when a therapeutic INR can be maintained with a daily warfarin dose of ≤5 mg.

Supporting References: (811, 812, 817, 818, 821, 824-827)



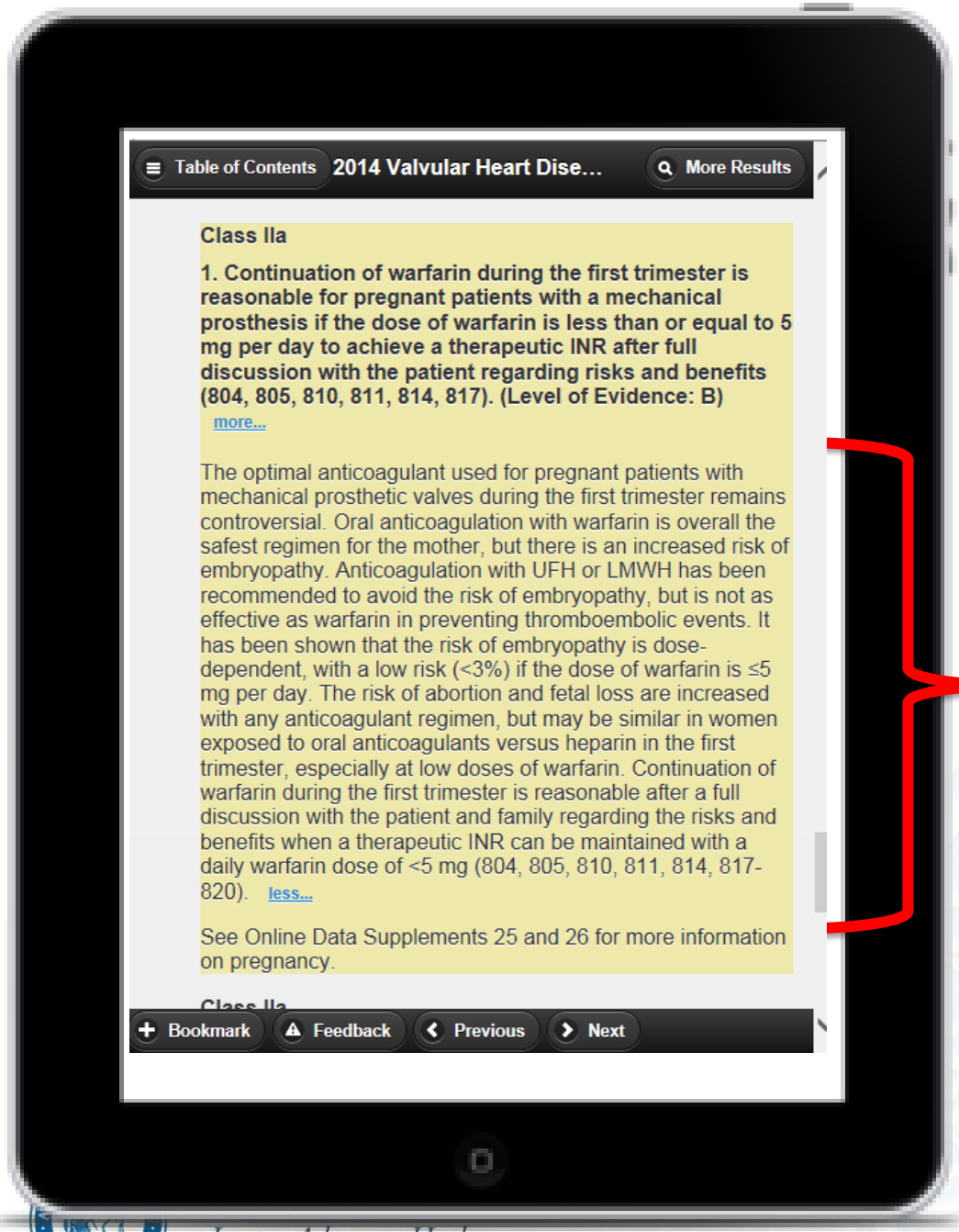
Type in "anticoagulation for mechanical valves during pregnancy"



Goes directly to the "knowledge byte" that is answers the question

Class Recommendation

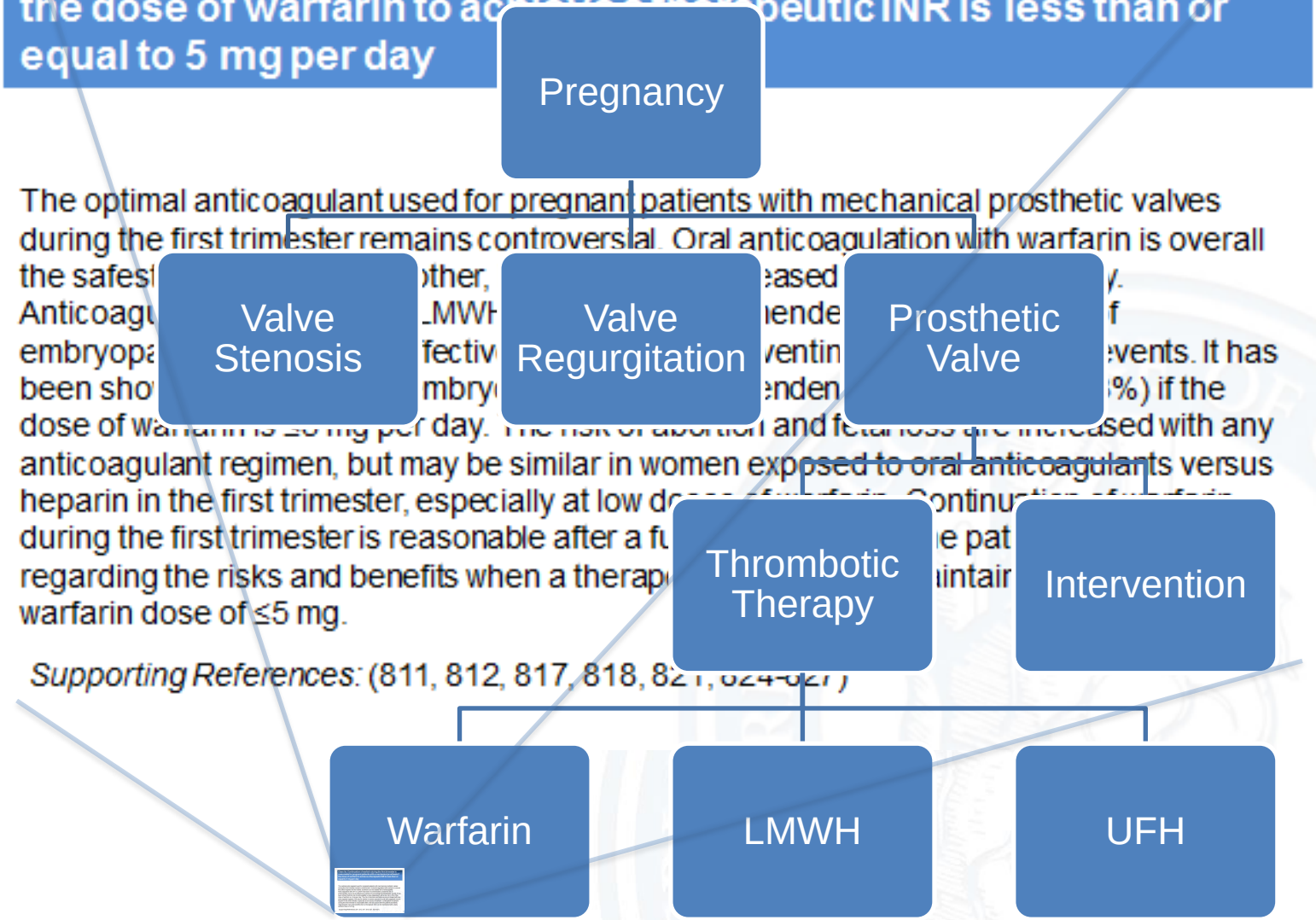
Read "more" for supporting text and references



Supporting text
Concise and relevant

Link to references
Tables

Class IIa: Continuation of warfarin during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin to ac[illegible]peutic INR is less than or equal to 5 mg per day



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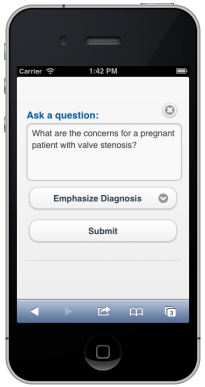

Point of Care Knowledge when you need it

Knowledge Byte

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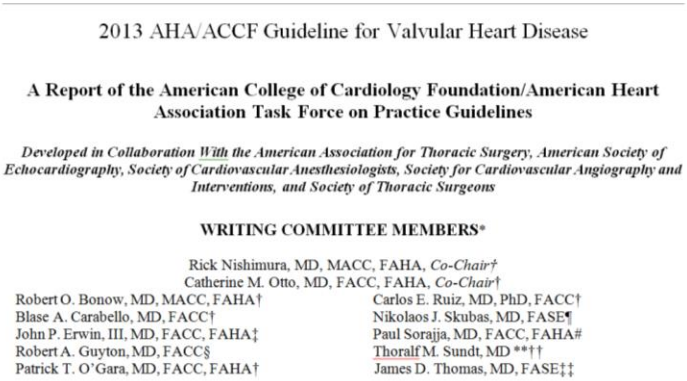

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ACC AHA Guidelines

“A Living Document….”

New Knowledge

Knowledge Byte

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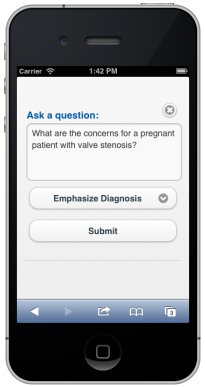

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Future Vision
"Executable Guidelines"

Knowledge Byte

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Patient Specific Data

Knowledge individualized to the patient
To the physician
To the patient

Future Vision
"Executable Guidelines"

To the physician : point of care "in the workflow"

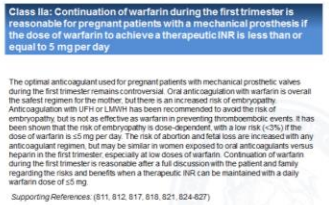
Patient specific guideline "byte"

Positive Pregnancy test

Lab INR > 1.5

Drug Warfarin

Dx Mitral stenosis



Class IIa: Continuation of warfarin during the first trimester is reasonable for pregnant patients with a mechanical prosthesis if the dose of warfarin to achieve a therapeutic INR is less than or equal to 5 mg per day

The optimal anticoagulant used for pregnant patients with mechanical prosthetic valves during the first trimester remains controversial. Oral anticoagulation with warfarin is overall the safest regimen for the mother, but there is an increased risk of embryopathy. Anticoagulation with UFH or LMWH has been recommended to avoid the risk of embryopathy, but is not as effective as warfarin in preventing thromboembolic events. It has been shown that the risk of embryopathy is dose-dependent, with a low risk (<3%) if the dose of warfarin is ≤5 mg per day. The risk of abortion and fetal loss are increased with any anticoagulant regimen, but may be similar in women exposed to oral anticoagulants versus heparin in the first trimester, especially at low doses of warfarin. Continuation of warfarin during the first trimester is reasonable after a full discussion with the patient and family regarding the risks and benefits when a therapeutic INR can be maintained with a daily warfarin dose of ≤5 mg.

Supporting References: (811, 812, 817, 818, 821, 824-827)

Alert knowledge byte

Knowledge individualized to the patient

To the physician

To the patient

Helping Cardiovascular Professionals Learn. Advance. Heal.

Future Vision
"Executable Guidelines"

To the physician : point of care "in the workflow"

Patient specific guideline "byte"
Alerts : new onset AF, abnormal labs, drug interaction
Clinical trials: patient specific inclusion criteria

To the patient

Alerts : new onset AF, abnormal labs
Appointment : for urgent conditions
Home monitoring: rhythm, weight, BP

Knowledge individualized to the patient
To the physician
To the patient

Data Modeling for Information Re-usability

- Current model supports document interchange
- Future models should support knowledge consumption
  - Living documents/change management
  - Search engines
  - Consumable/relevant chunks of information (Point-of-Care)
  - Mobile and voice-based applications
  - Question answering – “semantic analysis”
  - Executable knowledge - EMR integration