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The “Did You Know” & Must Knows of Intraop ECG Filtering in Adults



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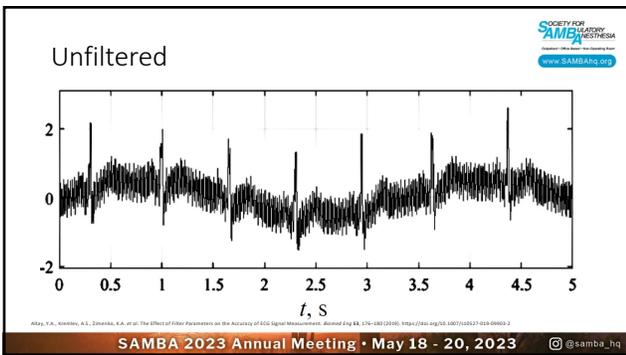

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Objectives

- Describe the need for intraoperative ECG filters.
- Differentiate between the filter types and modes of the ECG monitor and how they effect ECG morphology.

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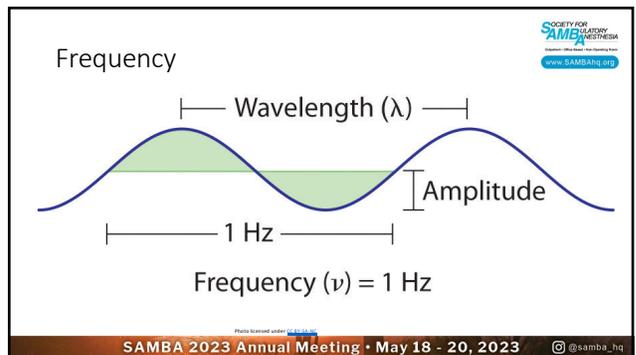
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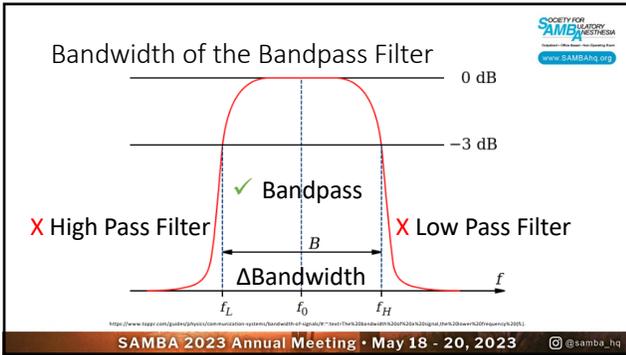
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Real Life: Frequency Noise

High Frequency
Electrosurgical Unit
Medical Device Interference
Somatic Muscle Interference
Poor Electrode Skin Contact

Low Frequency
Respiration
Motion Artifact
Baseline Wander

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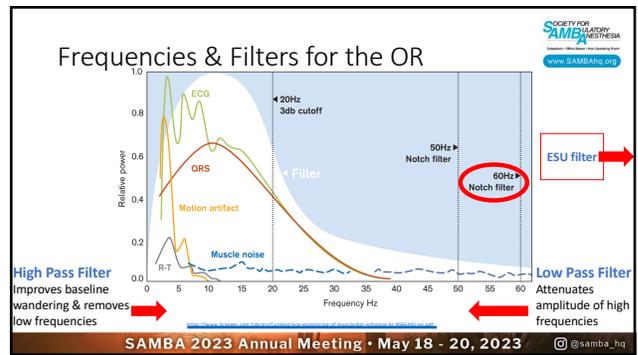
Artifact & Noise

- Body Movement
- Baseline Wander
- Muscle Noise
- Power Line Interference

Garcia-Necha J, et al. Technical innovation during the acquisition of the electrocardiogram. Ann Noninvasive Electromedical. 2008;14(6):589-601. doi:10.1111/j.1547-474x.2008.00328.x

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OR ECG Filter Modes: 2 Brands

Diagnostic • 0.05-150 Hz	Monitoring • 0.05-40 Hz	Moderate • 0.05-25 Hz	Maximum • 5-25 Hz
Diagnostic • 0.05-150 Hz	ST • 0.05-40 Hz	Monitoring • 0.5-40 Hz	Surgery • 1-20 Hz

Maglion L. A multifactorial evaluation with Mindray monitors - manufacturer's reply. Anesth Analg. 2017;125(2):790-795. doi:10.1111/anae.13819

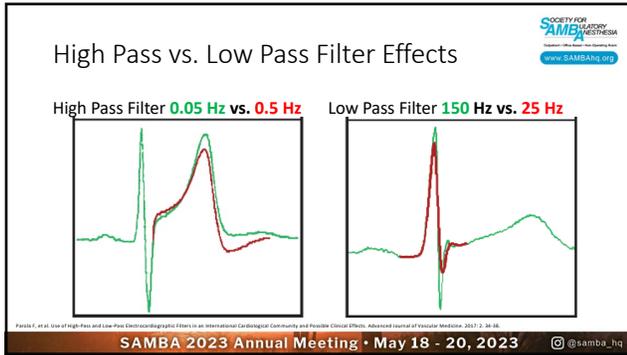
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Filter Noise vs **Minimize Distortion**

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Consequences....

Type of filter	ECG modifications with an inappropriate use	Diagnostic effects
High-pass	Alterations in ventricular repolarization (ST-T)	It mimics acute coronary syndrome [8] It mimics Brugada syndrome [9]
	Decrease in QRS width	Less diagnostic value for ventricular hypertrophy [5]
	Increase in Q waves duration	It mimics old infarction [5]
Low-pass	Decrease of pacemaker spike width	It mimics left bundle branch block or idioventricular rhythm [10]
	Attenuation, removal or modification of J waves	The pattern of early repolarization disappears or its expression changes [11]
	Attenuation or removal of Epsilon waves	Less diagnostic value of arrhythmogenic RV dysplasia [12]

Figure 1. et al. Use of High-Pass and Low-Pass Electrocardiographic Filters in an Interventional Cardiology Community and Possible Clinical Effects. *Advanced Journal of Epilepsy Medicine*. 2017; 3: 40-56.

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12-Lead

- Post-processing
 - Use of the filter (in auto mode):
 - Initial recording – filter off – recording made at 0.67 - 150Hz
 - Evidence of somatic muscle interference:
 - Repeat recording – filter on – recording made at 0.67 - 40Hz
 - The filter reduces interference but also distorts the ECG
 - Recommended recording bandwidths pre-stored in ECG device setup:
 - 'Auto' mode 0.67 – 150Hz
 - 'Manual' mode 0.05 – 150Hz
 - Mains filter off

Clinical Guidelines by Consensus
Recording a Standard 12-Lead Electrocardiogram
An approved method by the Society for Cardiological Science & Technology (SCST)

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Summary

Artifacts and Noise Exist!
Goals?

Minimize interference
More filtering → Monitoring or other proprietary modes

ST segment monitoring
Minimal filtering → Diagnostic

More Filtering = More Distortion

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