

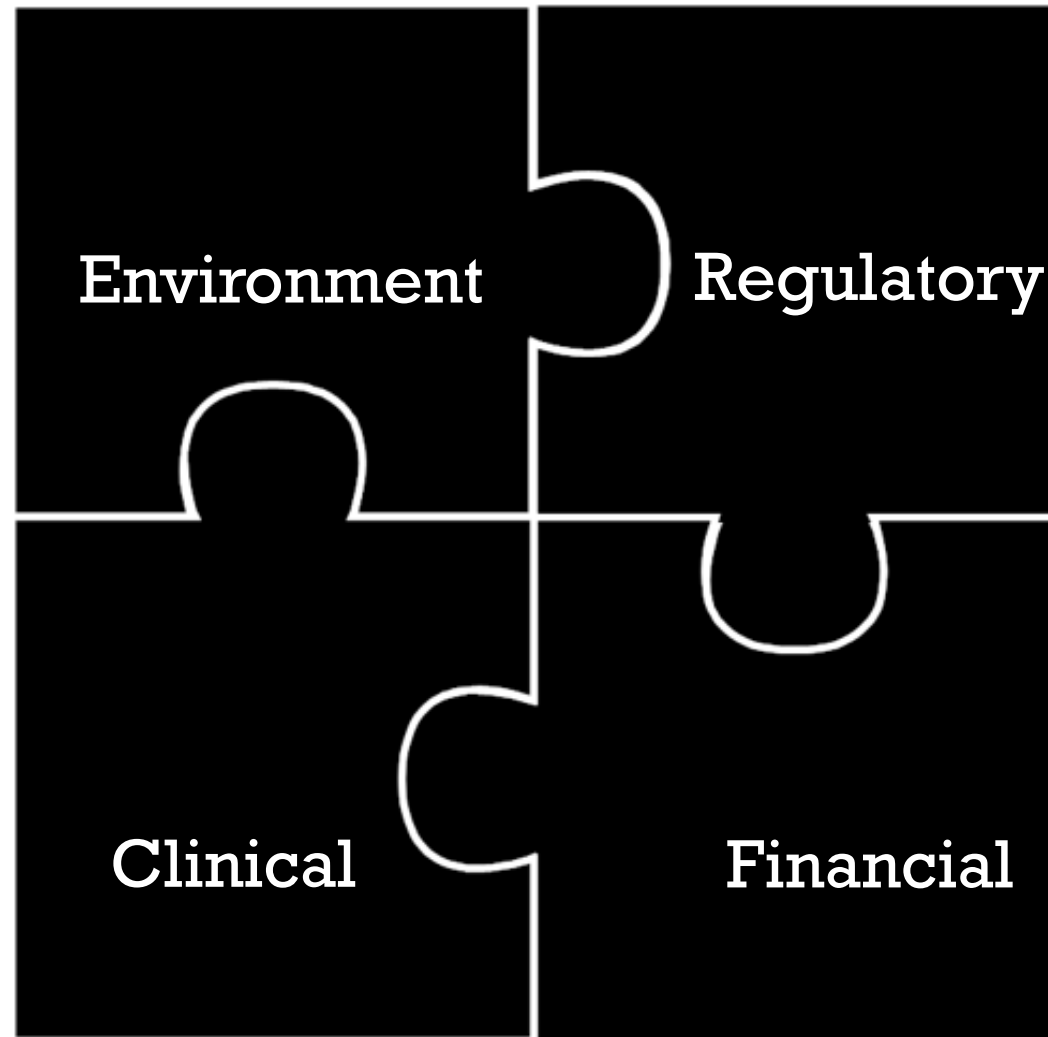
Wireless Medical Device Network Performance Testing

Brian Long, CWNE

IT Professional Wi-Fi Trek 2015
#wifitrek



Wi-Fi in Healthcare... Piecing it all Together



“Healthcare: The Most Challenging Wi-Fi Environment”

Marcus Burton, CWNE #78



Regulatory

- HIPAA – Privacy & Security Rules
- FDA Wireless Guidance
- IEC-80001

Risk Management



Financial Challenges



HealthLeaders Media

January 14, 2014

Financial Challenges
TOP Healthcare
CEO Concerns

INSTITUTE OF MEDICINE: Shaping the Future for Health

TO ERR IS HUMAN: BUILDING A SAFER HEALTH SYSTEM

- 1999 -

There are 98,000 Preventable Deaths

The New JCAHO Pain Standards: Implications for Pain Management Nurses

■■■ *Patricia H. Berry, PhD, RN, CRNH, CS, and June L. Dahl, PhD*

- 2001 -

Pain Management is a Patient Right

What Happened?

- 2004 -

Institute for Health Improvement Report 35
– 40% of Cardiopulmonary Arrests occur in
General Care Settings

What Happened?

- 2007 -

- HealthGrades Reports Post Operative Respiratory Adverse Events increase 18.7%
- The Avoidable Expense is estimated at \$1.55 B



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A 36-Hospital Time and Motion Study: How Do Medical-Surgical Nurses Spend Their Time?

Ann Hendrich, RN, MSN, FAAN • Marilyn P Chow, DNSc, RN, FAAN • Boguslaw A Skierczynski, PhD • Zhenqiang Lu, PhD

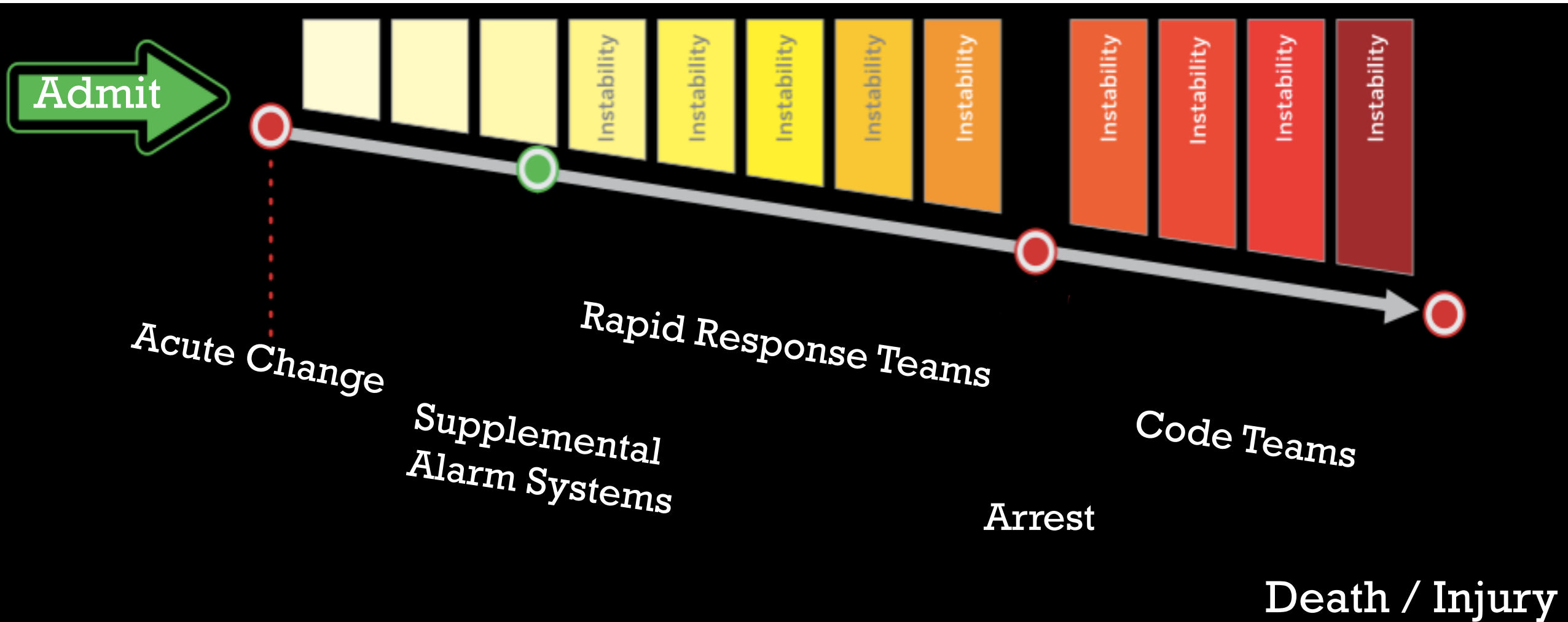
What Percentage of Time do Clinicians Spend on Patient Care Activities?

A 36-Hospital Time and Motion Study: How Do Medical-Surgical Nurses Spend Their Time?

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< 20% of Time

What has been tried?

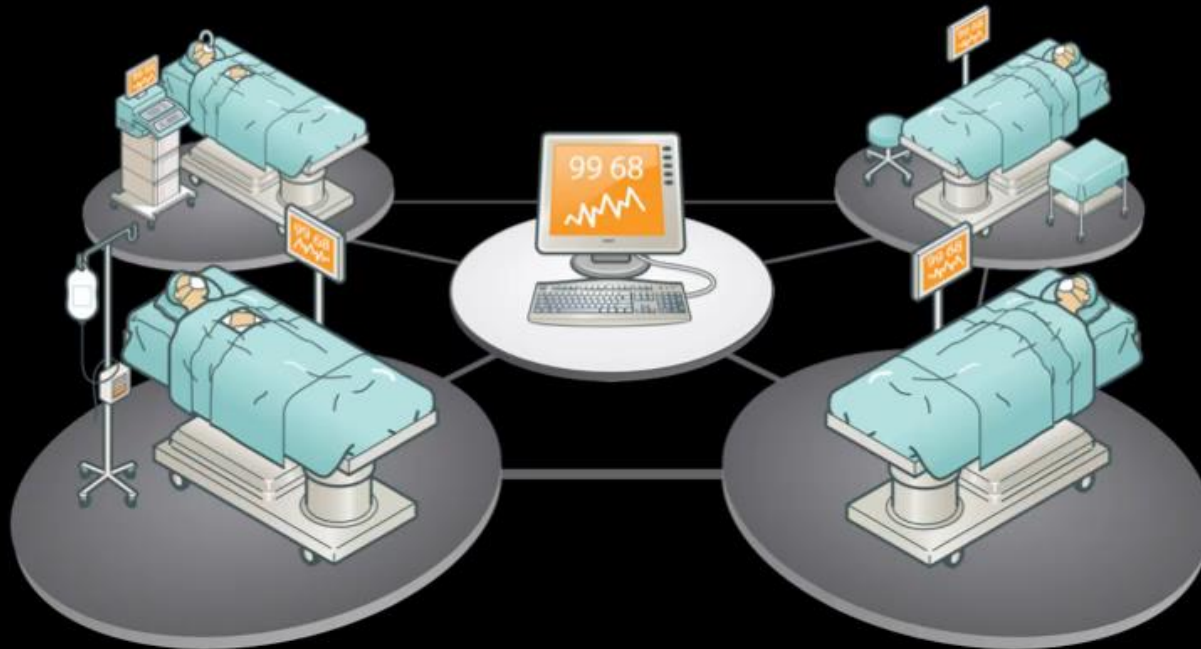


Patient Deterioration Time Factors

Approximately how much time does it take before there are irreversible patient physiological effects?

Patient Deterioration Time Factors

2 – 5 Minutes



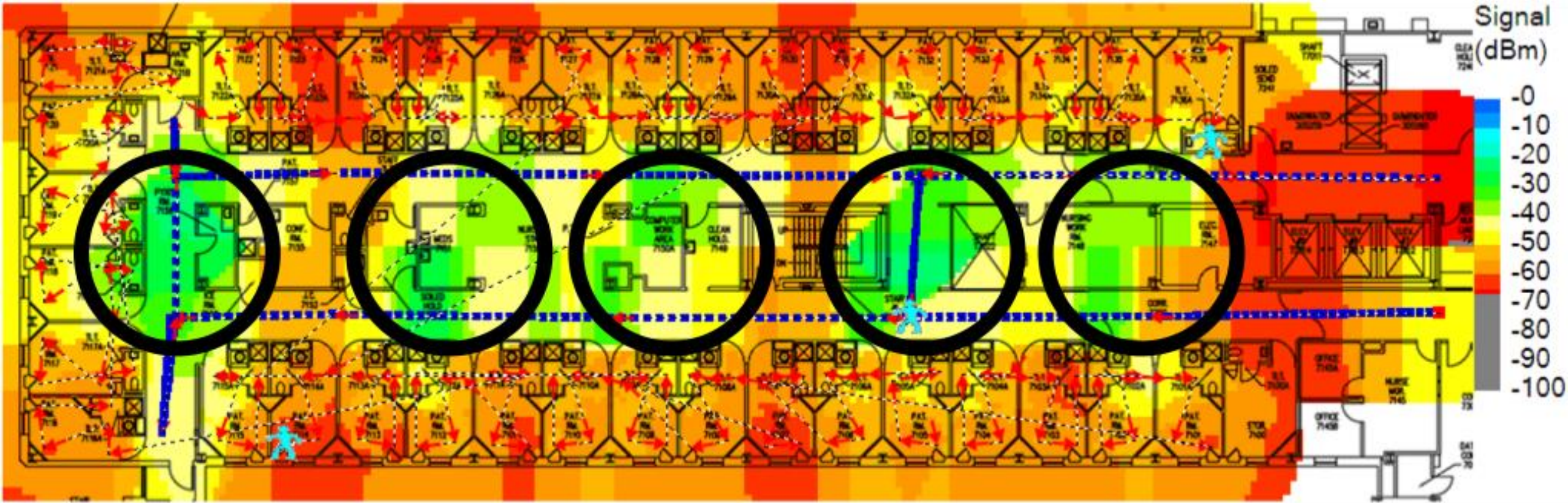
Sample Continuous Medical Device

No.	Time	Time delta from previous displayed frame	Source	Destination	Protocol	Length
41491	627.037548	0.000001000		Cisco_5f:fe:40 (RA)	802.11	40
41492	627.041933	0.004385000	SilexTec_8e:f5:d5	Vmware_c3:62:22	802.11	132
41493	627.041934	0.000001000		SilexTec_8e:f5:d5 (802.11)	802.11	40
41494	627.066186	0.024252000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41495	627.066188	0.000002000		SilexTec_43:64:4b (802.11)	802.11	40
41496	627.066808	0.000620000	Vmware_c3:62:22	SilexTec_43:64:4b	802.11	132
41497	627.067214	0.000406000	Vmware_c3:62:22	SilexTec_43:64:4b	802.11	132
41498	627.067215	0.000001000		Cisco_5f:fe:40 (RA)	802.11	40
41499	627.092032	0.024817000	Cisco_5f:fe:40	Broadcast	802.11	218
41500	627.194462	0.102430000	Cisco_5f:fe:40	Broadcast	802.11	218
41501	627.261285	0.066823000	SilexTec_8e:f5:d5	Vmware_c3:62:22	802.11	360
41502	627.261287	0.000002000		SilexTec_8e:f5:d5 (802.11)	802.11	40
41503	627.261892	0.000605000	Vmware_c3:62:22	SilexTec_8e:f5:d5	802.11	132
41504	627.262133	0.000241000	Vmware_c3:62:22	SilexTec_8e:f5:d5	802.11	132
41505	627.262134	0.000001000		Cisco_5f:fe:40 (RA)	802.11	40
41506	627.296853	0.034719000	Cisco_5f:fe:40	Broadcast	802.11	218
41507	627.356696	0.059843000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41508	627.356781	0.000085000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41509	627.357002	0.000221000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41510	627.357128	0.000126000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41511	627.357129	0.000001000		SilexTec_43:64:4b (802.11)	802.11	40
41512	627.359114	0.001985000	Vmware_c3:62:22	SilexTec_43:64:4b	802.11	132
41513	627.359114	0.000000000		Cisco_5f:fe:40 (RA)	802.11	40
41514	627.399342	0.040228000	Cisco_5f:fe:40	Broadcast	802.11	218
41515	627.433215	0.033873000	Cisco_bb:02:c1	Spanning-tree-(for-	802.11	108
41516	627.433481	0.000266000	Cisco_bb:02:c1	Spanning-tree-(for-	802.11	108
41517	627.501716	0.068235000	Cisco_5f:fe:40	Broadcast	802.11	218
41518	627.543293	0.041577000	Vmware_c3:62:22	SilexTec_8e:f5:d5	802.11	141
41519	627.543295	0.000002000		Cisco_5f:fe:40 (RA)	802.11	40
41520	627.547801	0.004506000	SilexTec_8e:f5:d5	Vmware_c3:62:22	802.11	132
41521	627.547802	0.000001000		SilexTec_8e:f5:d5 (802.11)	802.11	40
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41523	627.646209	0.042159000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404
41524	627.646447	0.000238000	SilexTec_43:64:4b	Vmware_c3:62:22	802.11	404

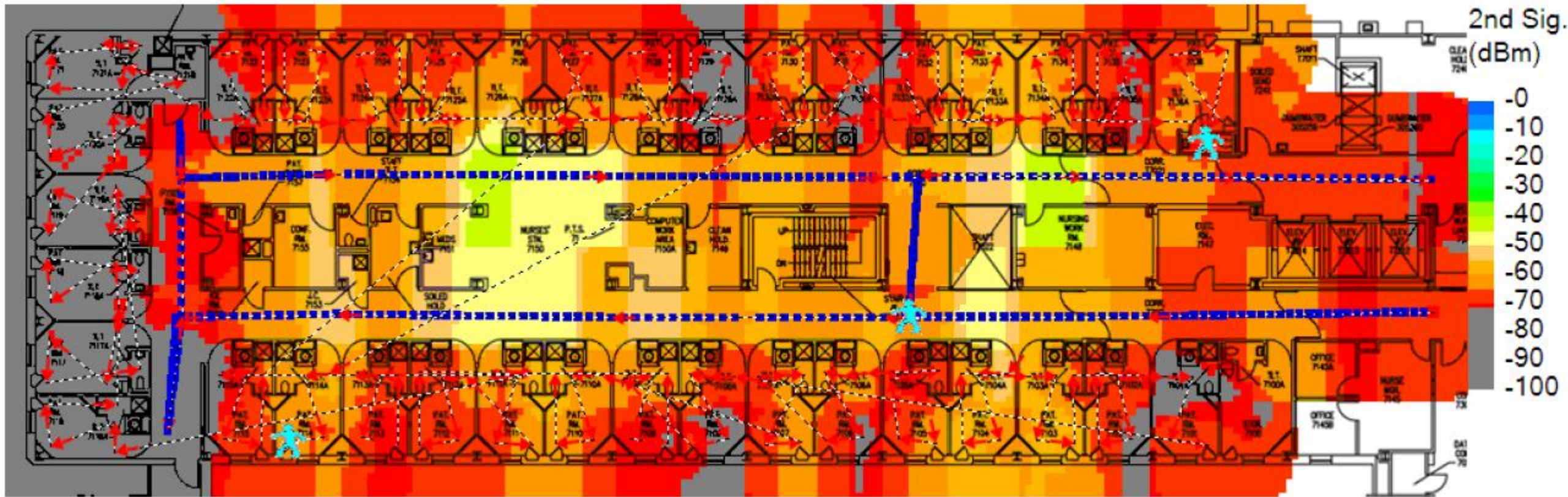
Network Requirements & Testing – 24hr Test

Requirement	Metric	Test
Wireless Coverage	Primary: -67 dBm Secondary: -72 dBm	Wireless Site Survey w/ Spectrum Analysis
Latency	Hardwire: <30 ms Wireless: <100 ms	Ping Test
Packet Loss	< 2%	
Availability	99.9%	
Clinician Experience	No Unexplainable Network Disconnects	Disconnect Report

Initial Wireless Site Survey Primary Coverage

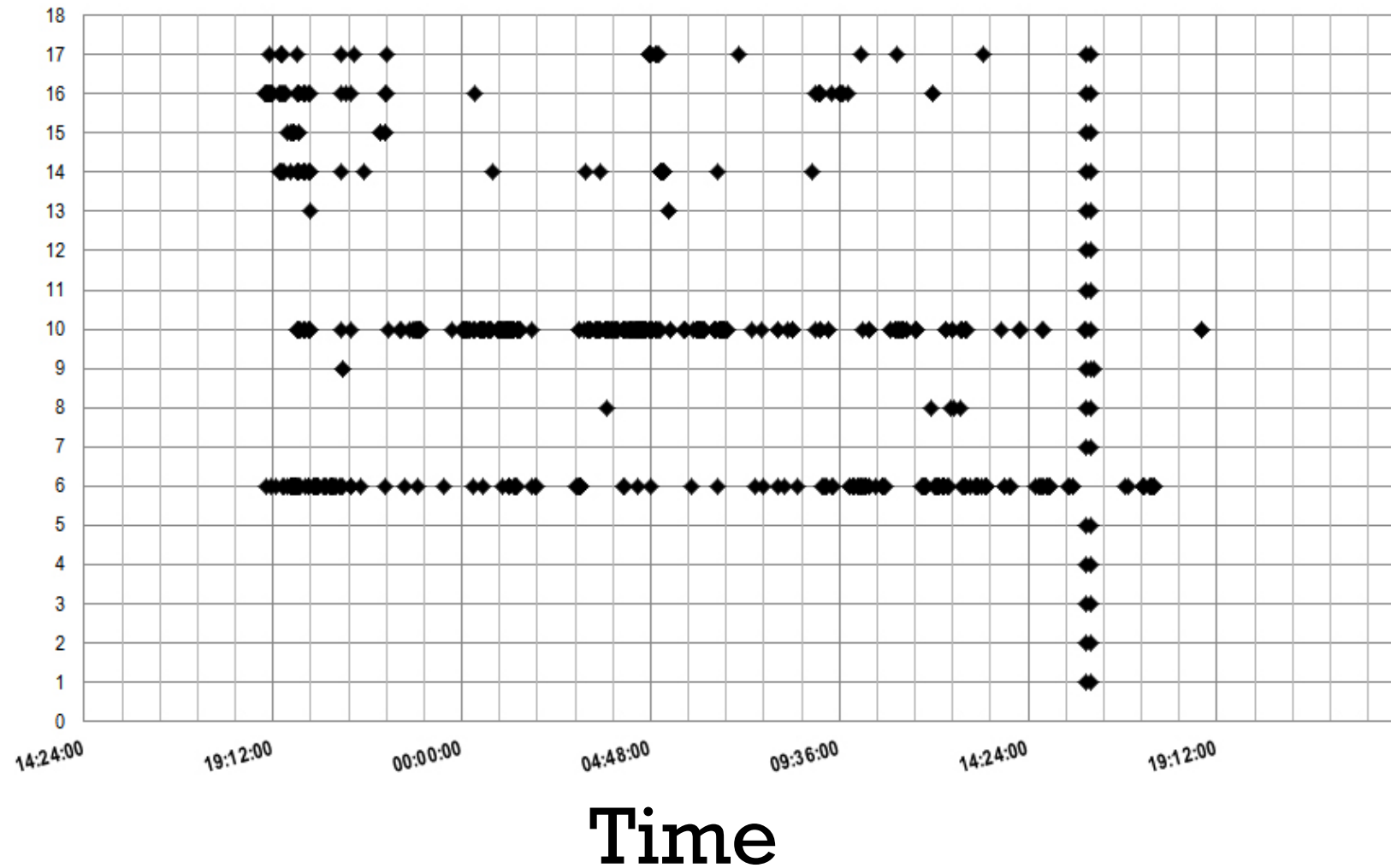


Initial Wireless Site Survey Secondary Coverage

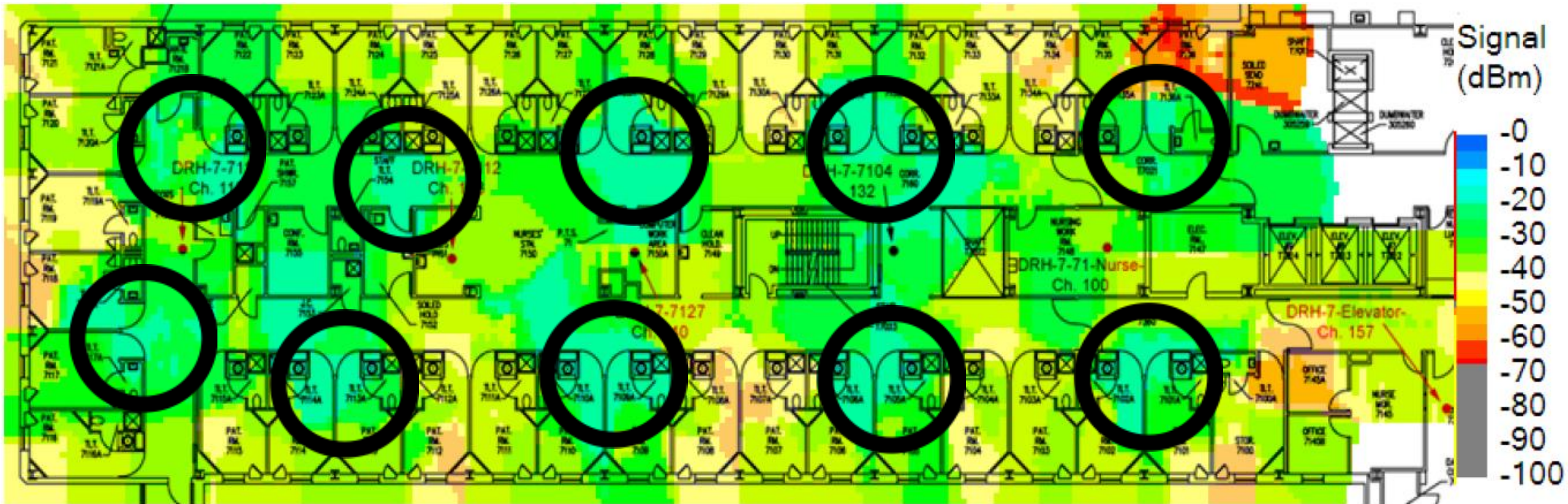


Network Application Disconnect Report

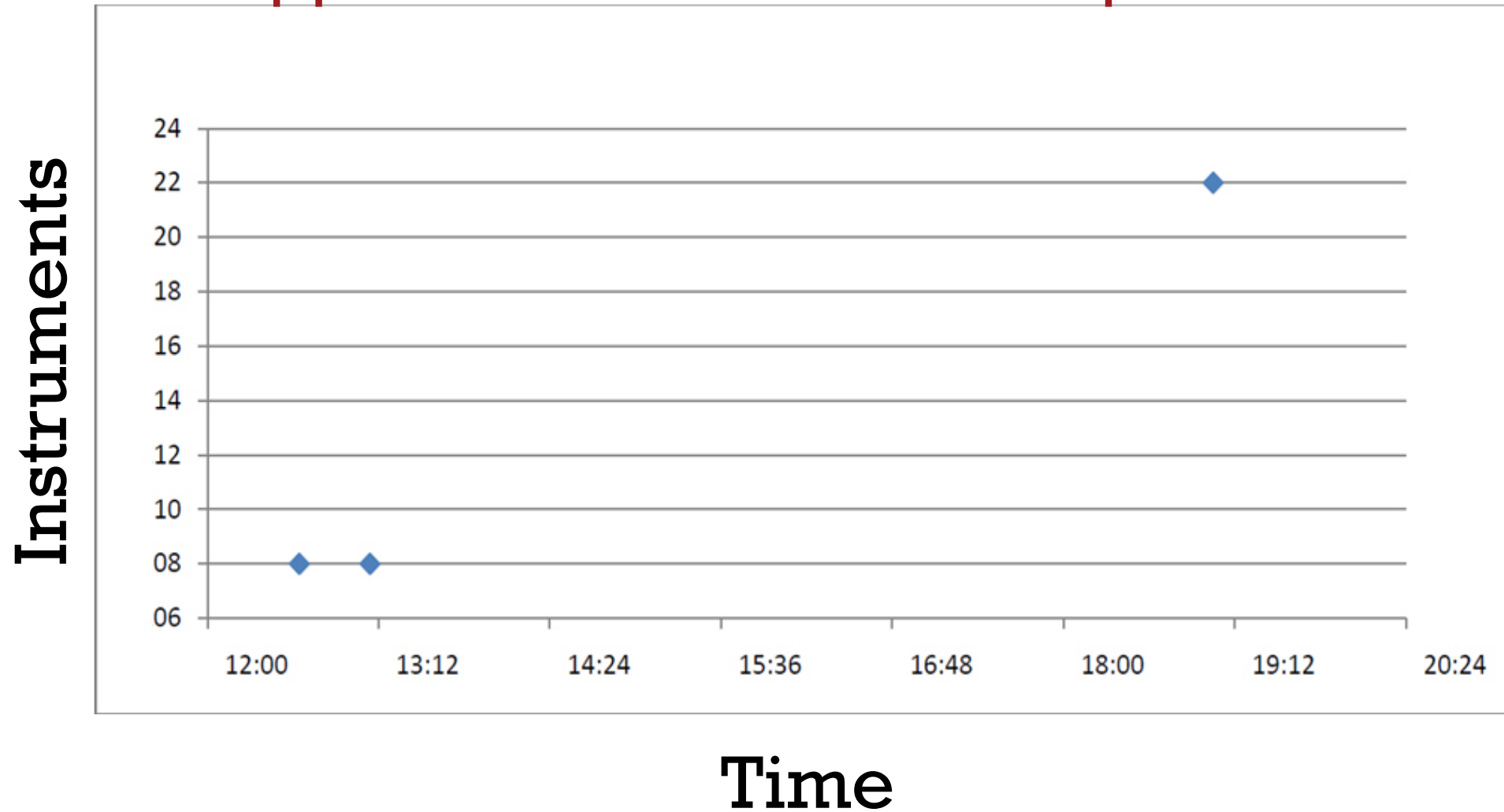
Instruments



Wireless Site Survey – Post Remediation Primary Coverage



Network Application Disconnect Report



Impact of Pulse Oximetry Surveillance on Rescue Events and Intensive Care Unit Transfers?

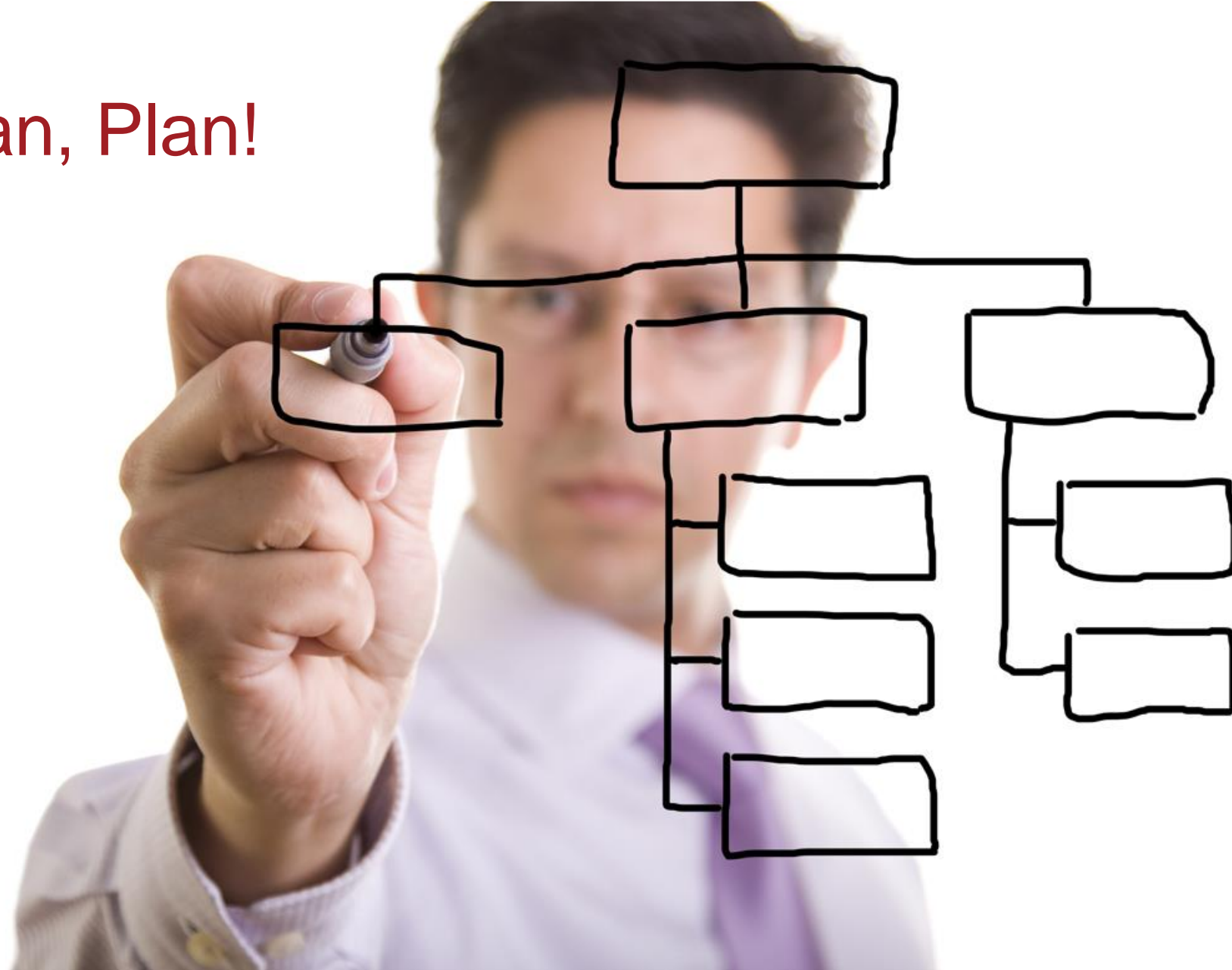
A Before-and-After Concurrence Study

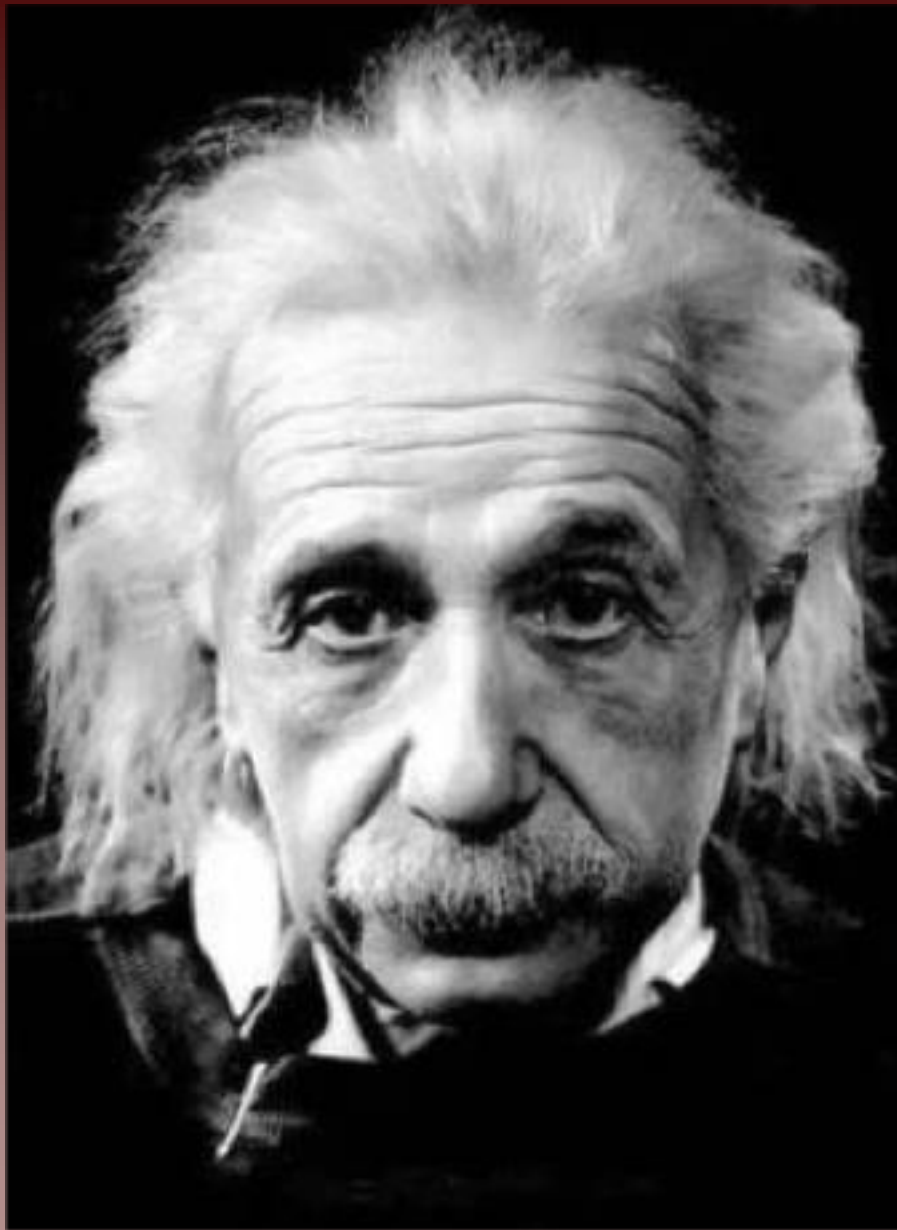
Andreas H. Taenzer, M.D., F.A.A.P.,* Joshua B. Pyke, B.E.,† Susan P. McGrath, Ph.D.,‡ George T. Blike, M.D.§

■ 10 Month Study :: 36-Bed Unit :: 2,841 Patients :: 9,978 Monitored Days

Wireless System Uptime	99.9995%
Patient Compliance	98.2%
Average Alarms / Patient / Day	4

Plan, Plan, Plan!





"Once you stop
learning, you
start dying"

~ Albert Einstein ~



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Certified Wireless Network Professional

