



# Next Generation Telehealth: Data Integration and Decision Support

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# Telemedicine Applications

- Audio-video teleconferencing for patient care *Maturing, Expanding*
- Images of patient (photography, pathology, radiology) *Maturing*
- Medical devices acquire physiologic or other patient data
  - Glucose, patient weight, BP
  - Pill box container “open”

*Expanding*

# Telemedicine Applications

- Audio-video teleconferencing for patient care *Stand-alone*
- Images of patient (photography, pathology, radiology) *Stand-alone*
- Medical devices acquire physiologic or other patient data
  - Blood glucose, patient weight
  - Pill box container “open”

*Devices stand-alone; data stand-alone*

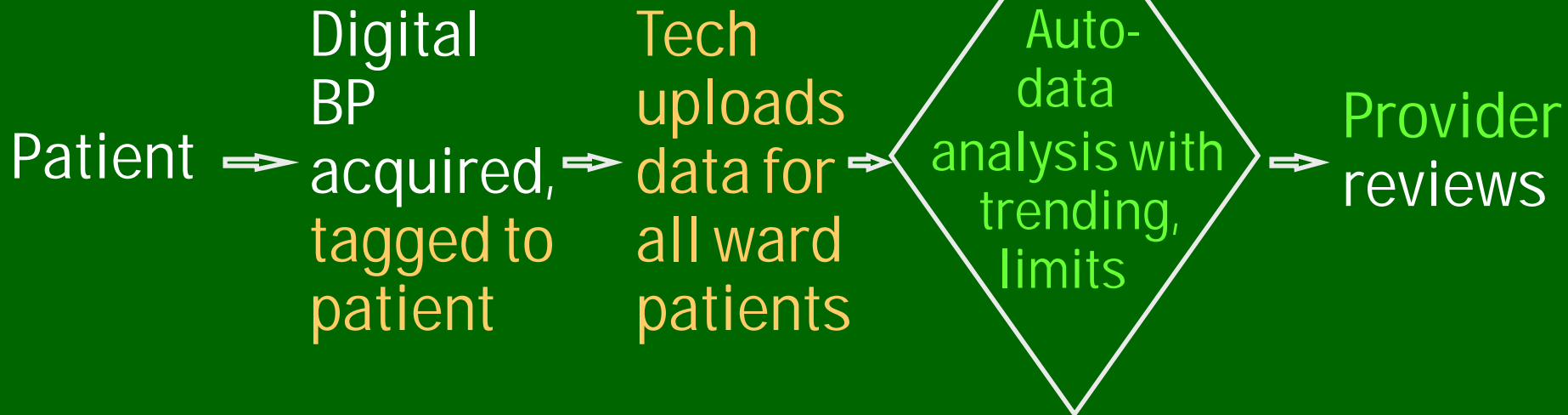
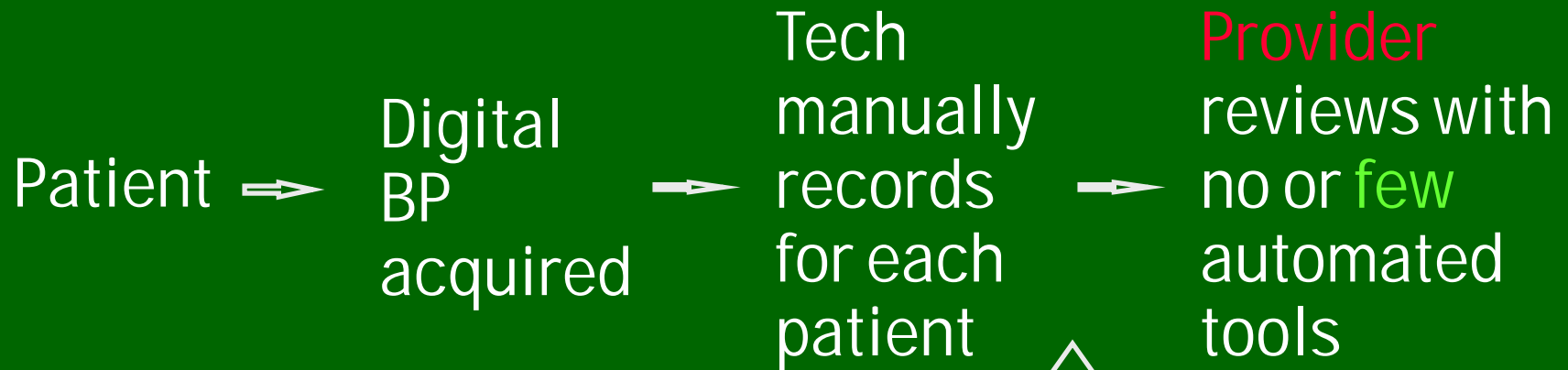
# Medical Devices and Data

- Acquire data
- Local decision-support for patient\provider
- Store data locally
- Transfer data off-site
- Store data off-site (stand-alone, EHR)
- Automate analysis (decision-support)
- Present data to providers (tables, graphs);  
immediate, **longitudinal**

# **BioInformatics (Clinical):**

- **General term for information acquisition, transmission, storage, and analysis of patient related data**
- **Electronic Health Records (EHRs) should play a central role in this process**
- **EHRs do NOT automate data acquisition and analysis well**

# Vital Signs in a Hospital



# Electronic Health Record



Pillbox



Scale



BP



Glucose





Pillbox



Scale



BP



Glucose



- Read only
- One by one
- Costly

- Stand-alone systems
- Non-integrated data
- Disparate databases

# EHR

- Data repository – Peripheral devices  
– **Manual, Not Automated**
- Data repository – Central Systems  
– **Yes, automated**
- System processes – **Yes; customize?**
- Decision support – Pharmacy – **Yes**
- Decision support – Other - **No**



Pillbox



Scale



BP



Glucose



# Universal Middleware



# Electronic Health Record



# Middleware Requirements

- **Standardized specifications across industry for EHR read\write capability**
  - Allows one platform to interface with all EHRs
  - EHRs standardize changes for hole in the firewall
  - Standardized specs for data upload
- **Medical devices comply with upload standards**

# Middleware Requirements

- **Customizable Decision-Support Tools**
  - Alarm limits
  - Trending limits
  - Notification methods after alarms triggered
- **Can permit proprietary algorithms**

# Summary

- Digital medical devices are proliferating for patient-centric care at home or work
- Transmission of data is not difficult
- Integration of data into relational databases is severely deficient
- EHR systems do not currently facilitate data integration, automated analysis
- Failure of data integration will limit the proliferation of patient-centric telehealth tools