

Understanding laboratory medicine



International Federation of Clinical Chemistry & Laboratory Medicine
Committee on Public Relations

Laboratory medicine: A hidden treasure in health care

94% **objective data in medical records**

60-70% **clinical decisions influenced**

37% **of practice guidelines**

23 % **different disease areas & growing number of companion diagnostics**

Sources: IMS Report 2003, www.VDGH.de / Forsman, R.W. (2002) *Clin. Leadersh. Manag. Rev.*, **16**, 370 / Forsman, R.W. (2000) *Clin. Leadersh. Manag. Rev.*, **14**, 292 / Gibler et al. 1992, *Annals of Emergency Medicine*, 21, 504 / Herrmann et al., 2001 *Med. Klinik*, 144 / *Clinica* 19.7. + 13.9.2002, 11.04.2002

Why is laboratory medicine important?



Laboratory
Medicine



Routine patient care

- Both acute and chronic patient care requires laboratory testing



Speed and accuracy of results

- Laboratory equipment and methods improved
- High throughput, automated platforms



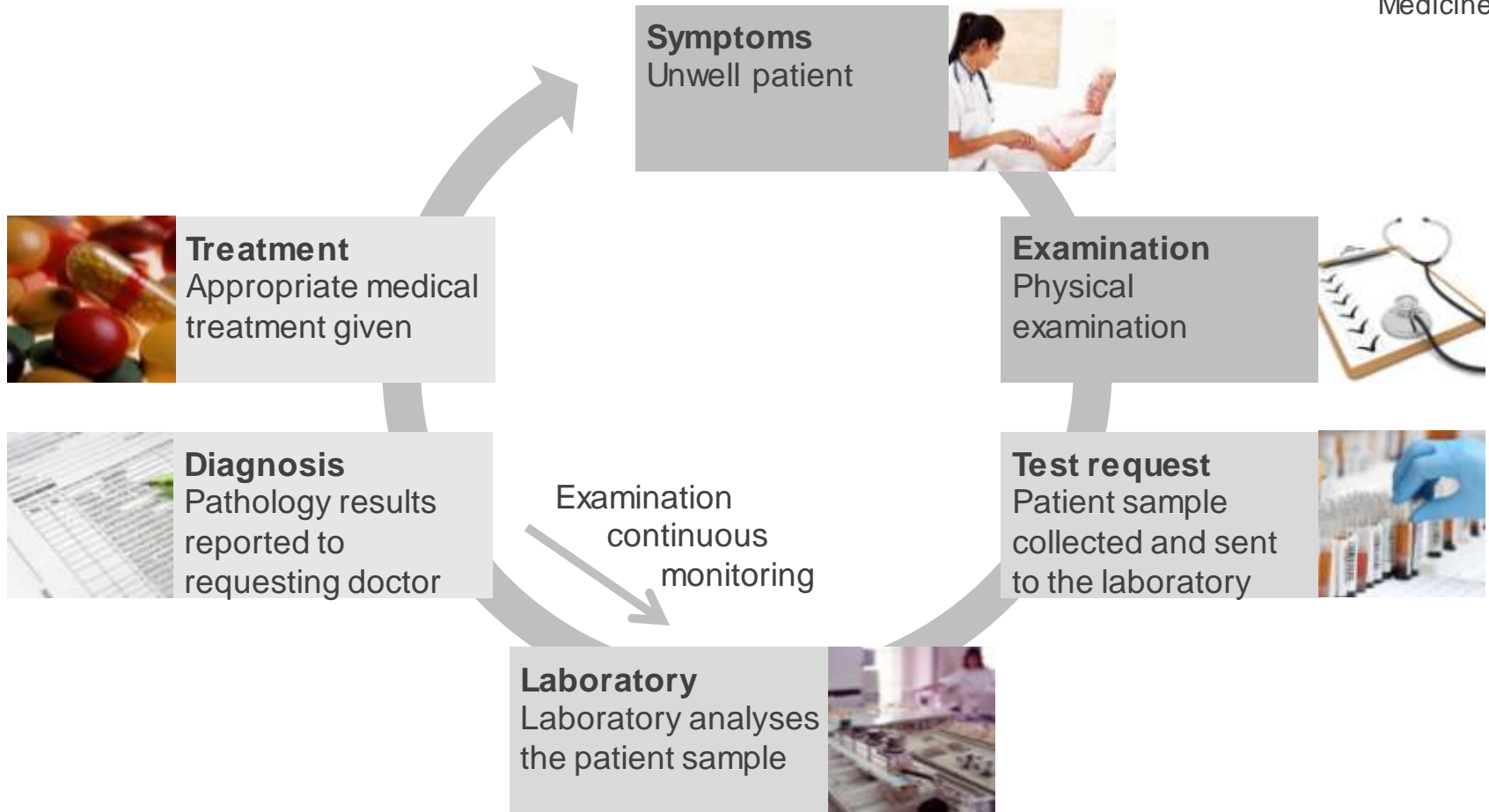
Quality laboratory results

- Evidence-based decisions and diagnosis
- Monitor disease progression/treatment

What happens to my sample?



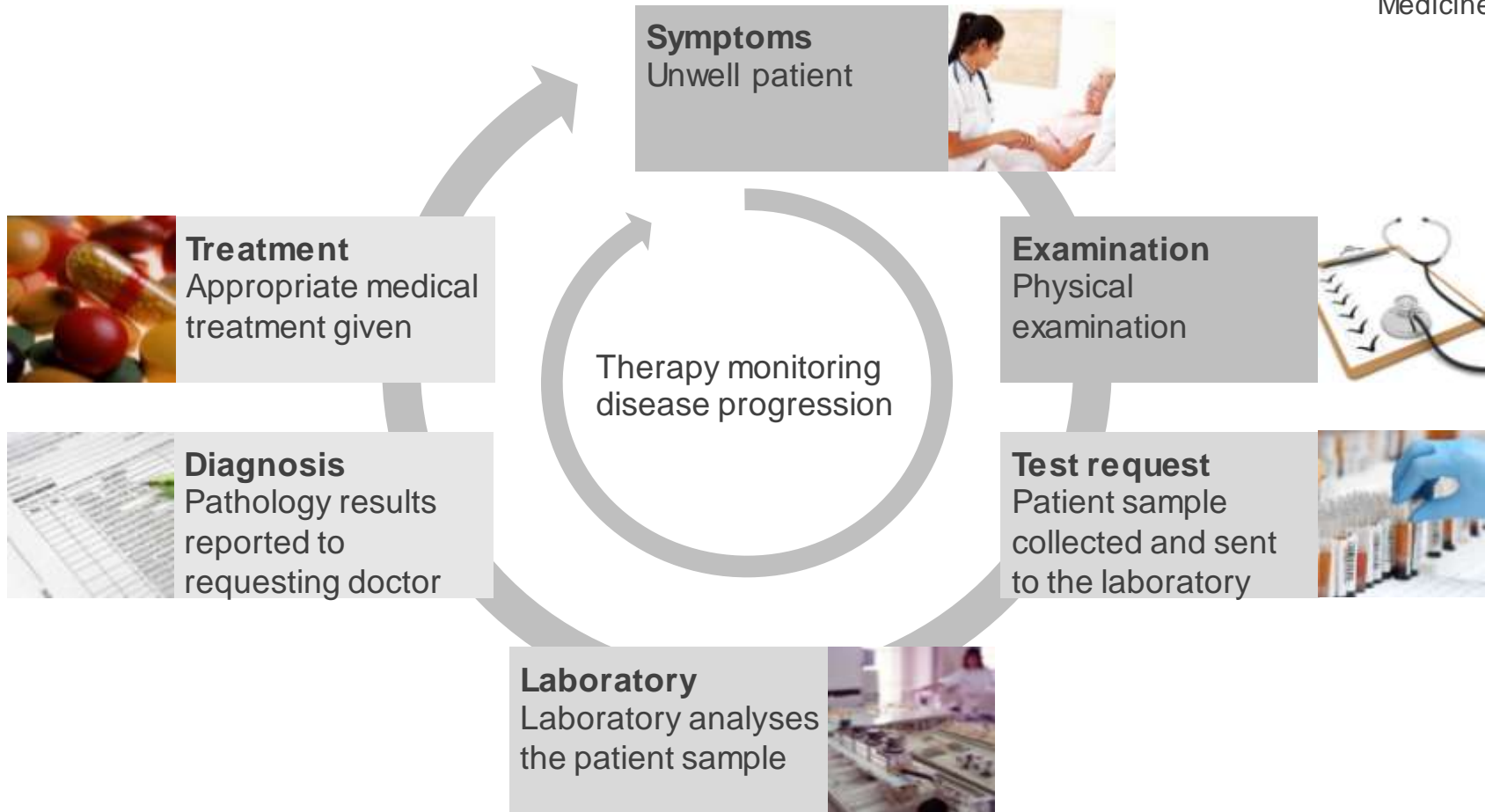
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What happens to my sample?



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Who can look at my results?



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Laboratory staff

- Strict patient confidentiality regulations exist
- Laboratory staff release results to requesting doctor



Requesting doctor

- Receives paper or electronic copy of test results
- Doctor discusses results with patient



Patient

- May have direct access to test results
- Results are stored in medical record

Are my results accurate?



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Internal quality control

- No patient results are released until internal quality control for the method is acceptable
- Defined rules for acceptance of QC



Validation and notification

- Highly developed software used to review results
- Abnormal results require validation by scientist



Quality assurance

- External QA programs
- Strict staff training and competency testing
- Accreditation of laboratory by external agency

Laboratory medicine disciplines



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Pathologists

- Interprets pathology results
- Medical qualification
- Pathology specialist training



Clinical Lab Scientists

- Performs test analysis
- Verifies results
- Scientific qualification - Degree level



Technicians

- Assists scientists in laboratory
- Scientific qualification - Diploma level



Phlebotomists

- Collect blood, urine and other samples from patient
- Blood collection certificate



Specimen Receptionists

- Specimen handling & identification
- Patient data entry

Specialities in laboratory medicine



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Biochemistry

Blood & Urine
Hormones
Glucose
Lipids
Liver/ Kidney
function



Haematology

Blood cells
Blood type
Clotting
disorders
Blood products



Microbiology

Urine
Fluids
Infections
Bacteria
Viruses
Resistance



Pathology

Tissues
Cell structure
Abnormalities



Molecular Diagnostics

DNA
Genetic traits
Inheritance



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A few practical examples

Have I had a heart attack?



55 year old male with severe chest pain arrives at Emergency

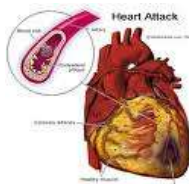


Cardiac surgeon performs angiogram and inserts stent to re-open artery

Examination by Doctor
ECG Trace
Blood collected

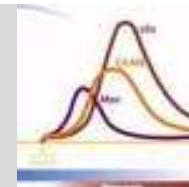


Monitor recovery



Lab results confirm heart attack due to block in artery

Lab tests for cardiac markers (CK, Troponin)



Is my blood healthy?



Haematology

7 month African American female with inflammation of toe, present for 3 weeks



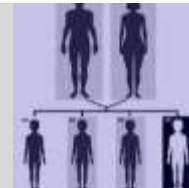
Blood collected from all family members



All family members blood analysed: 'Sickle cells' detected in 1:4 children in family



Parents are both 'carriers' of abnormal haemoglobin gene (HbS)



Patient will be treated and monitored to increase life expectancy (48 years)

Do I have an infection?



Microbiology

25yo female with fever, pain on urination visits general practitioner



Patient urine sample collected

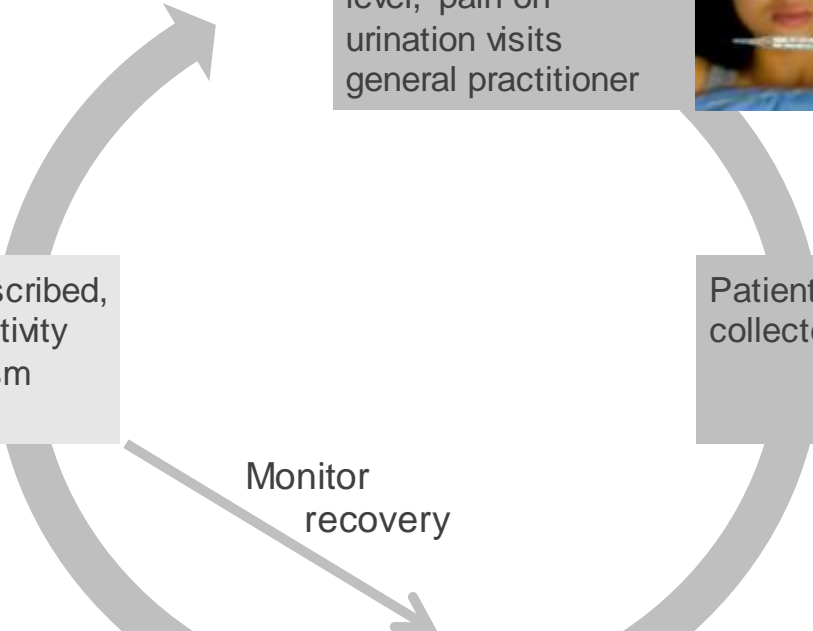


Antibiotics prescribed, based on sensitivity of microorganism cultured



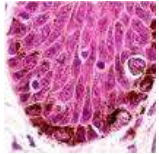
Urine sent to lab for urine culture and sensitivity testing - UTI confirmed

Urine "dipstick" in general practitioner office shows white cells in urine

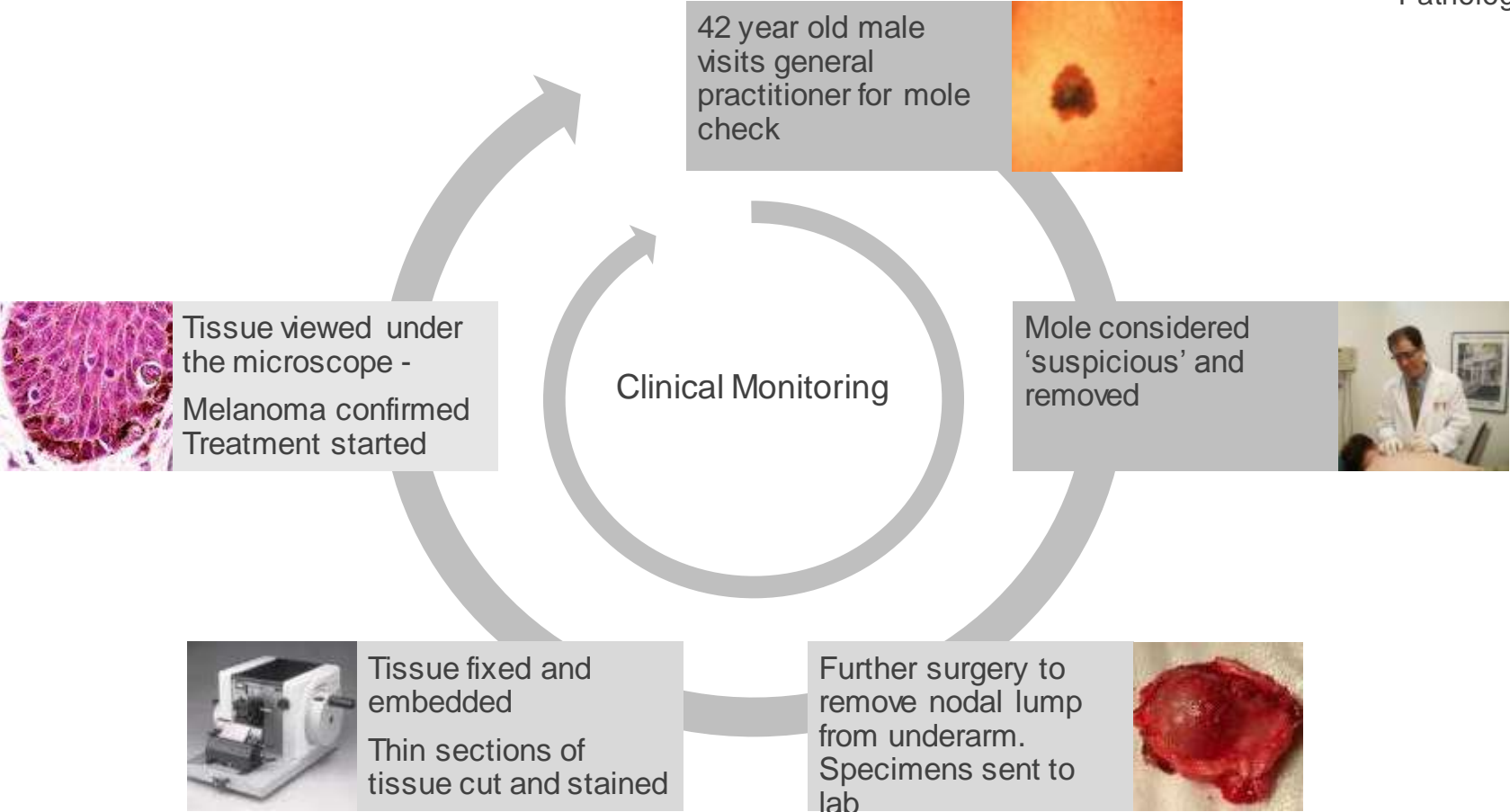


Monitor recovery

Do I have skin cancer?



Pathology



Is my unborn child healthy?



Molecular
Diagnostics

37yo female G₃P₀
considered high risk
of abnormal
pregnancy



Chromosome number
checked for major
abnormalities (FISH):
Normal pregnancy

Mother's blood
screened for markers
of Down syndrome:
Abnormality found



Placental sample put
into sterile culture
media – to lab



Placental sample
collected using a fine
needle (CVS)



Patient Self-Testing & Point of Care Testing



Common, simple POCT

- Urine pregnancy test
- Detects β -HCG elevated in pregnancy



Diabetes management at home

- Blood collected by fingerprick
- Blood glucose result in 2-3 minutes



Point of care testing in general practitioner clinic

- Lipid evaluation – cholesterol, triglyceride
- INR (blood clotting time) for patients on anticoagulant therapy

...Lab of the future?



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- Lab on a Chip
- Multiplex systems
- Automated MS-MS
- Biosensors for real-time patient monitoring

What is being done now? – The IFCC



What does the IFCC do?



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Scientific Activities

- Develops best practice laboratory guidelines
- Develops reference materials
- Encourages innovation and excellence



Education

- Transfers knowledge to laboratories in developing countries
- Encourages global information exchange
- Develops unique education programs



Public Relations/Communications

- Promotes profession
- Publishes scientific documents & papers
- Holds international scientific meetings

How can I learn more?



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