Pre-analytical errors related to venous sample collection and sample handling

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Biochemia Medica

EFLM WG-Preanalytical Phase

http://www.primap.com/

I will talk about…

- Why phlebotomy?
- Who is doing phlebotomy?
- How to do it properly?
  - What are the possible errors?
  - What are the consequences?
- How to improve the quality of phlebotomy?

Case # 1

- 7:30 a.m.
- Patient arrives to the laboratory outpatient unit. His last meal was at 21:00 on the previous day. In the morning he had coffee with milk (without sugar) and one cigarette. Routine chemistry and hematology tests are requested. Is this patient properly prepared for blood tests?

a) Yes
b) No

Why phlebotomy?

- most common invasive procedure in the healthcare
- available worldwide (hospitals, PHC, home based care)
- huge variations in technique, use of safety devices, disposal methods, reuse of devices and availability of postexposure prophylaxis.
- variations between countries, institutions, individuals

- the most common source of preanalytical errors.
- errors often go unrecognized.
- consequences:
  - Incorrect test results
  - Unnecessary delays
  - Harm to the patient and phlebotomist
  - Unnecessary cost

Who is doing phlebotomy?

- large heterogeneity!
- mostly nurses
- phlebotomy is performed by medical and nonmedical personnel (even admin staff)
- different level of education and life long training

- **patients should receive the same level of care across the globe!**

Simundic AM, et al. Survey of national guidelines, education and training on phlebotomy in 28 European countries: an original report by the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) working group for the preanalytical phase (WG-PA). CCLM 2013;51(8):1585-93.

How to do it properly?

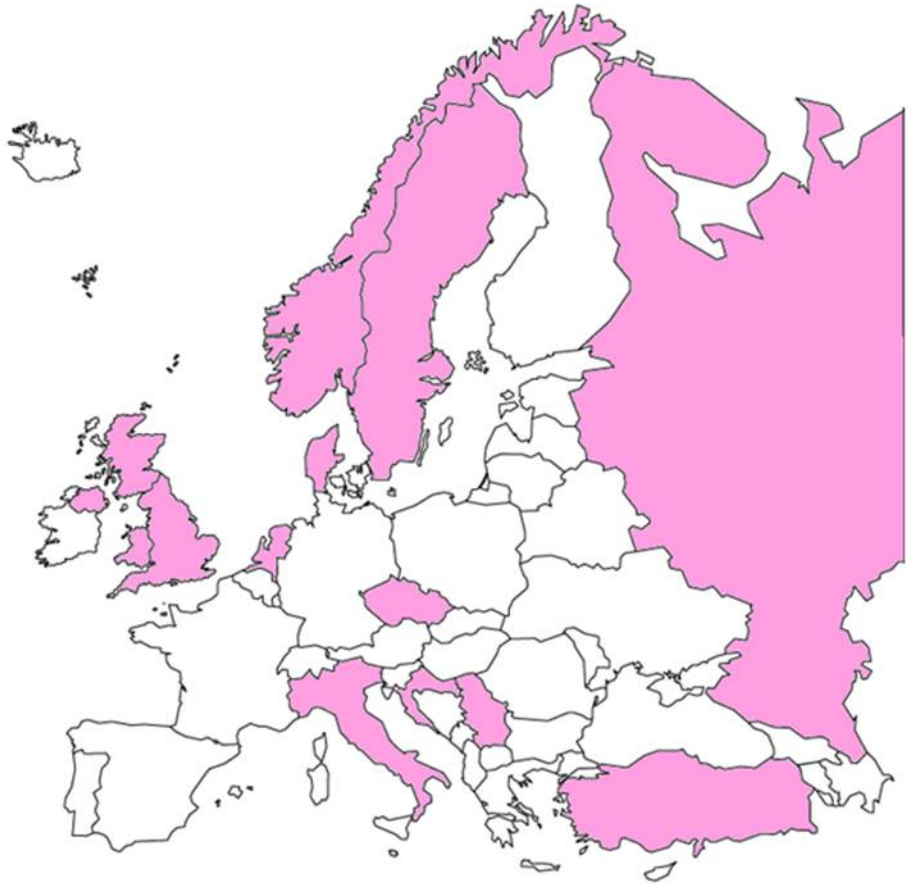
- CLSI guidelines
  - GP41-A6 Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard—Sixth Edition (2007) (Formerly H03-A6)
  - Not for free ☹
- WHO guidelines . ***(free access)***
  - WHO guidelines on drawing blood: best practices in phlebotomy (2010)
  - In English, Chinese, French, Portuguese ☺
- National guidelines
  - Some are published in English, most are published in local language
  - *Example: Nikolac N, Supak-Smolcic V, Simundic AM, Celap I. Croatian Society of Medical Biochemistry and Laboratory Medicine: national recommendations for venous blood sampling. Biochem Med 2013;23(3):242-54.* ***(free access)***

Situation in Europe

- only 7/28 European countries have national guidelines for phlebotomy:
  - Ireland, UK, Spain, Slovenia, Sweden, Italy and Croatia
- estimated compliance with the guidelines is poor
- there is a need for continuous education and implementation of existing procedures

Simundic AM, et al. Survey of national guidelines, education and training on phlebotomy in 28 European countries: an original report by the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) working group for the preanalytical phase (WG-PA). CCLM 2013;51(8):1585-93.

EFLM WG-PRE observational study



This study was performed during June 2013 – March 2014.

12 countries have participated in this study:

1. Croatia,
2. Czech Republic,
3. Denmark,
4. Italy,
5. Kazakhstan,
6. Netherlands,
7. Norway,
8. Russia,
9. Serbia,
10. Sweden,
11. Turkey,
12. UK

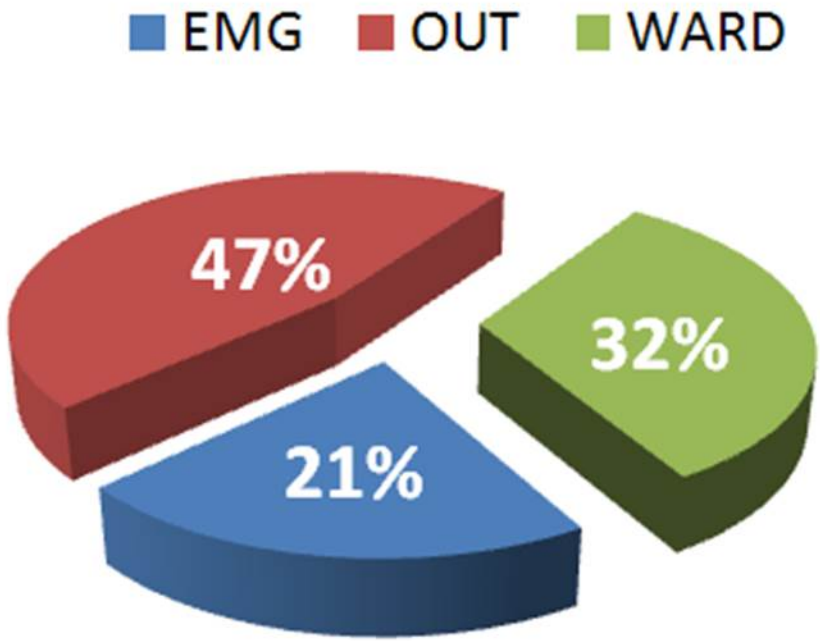
N=336

The median number of audits per country was 33 (18 – 36).

- compliance with CLSI GP41-A6 standard was assessed through witness audits (3 phlebotomies per each phlebotomist)

Simundic AM, et al. Compliance of blood sampling procedures with the CLSI H3-A6 guidelines: An observational study by the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) working group for the preanalytical phase (WG-PRE). CCLM 2014, e-pub ahead of print

Distribution of locations participating in the study



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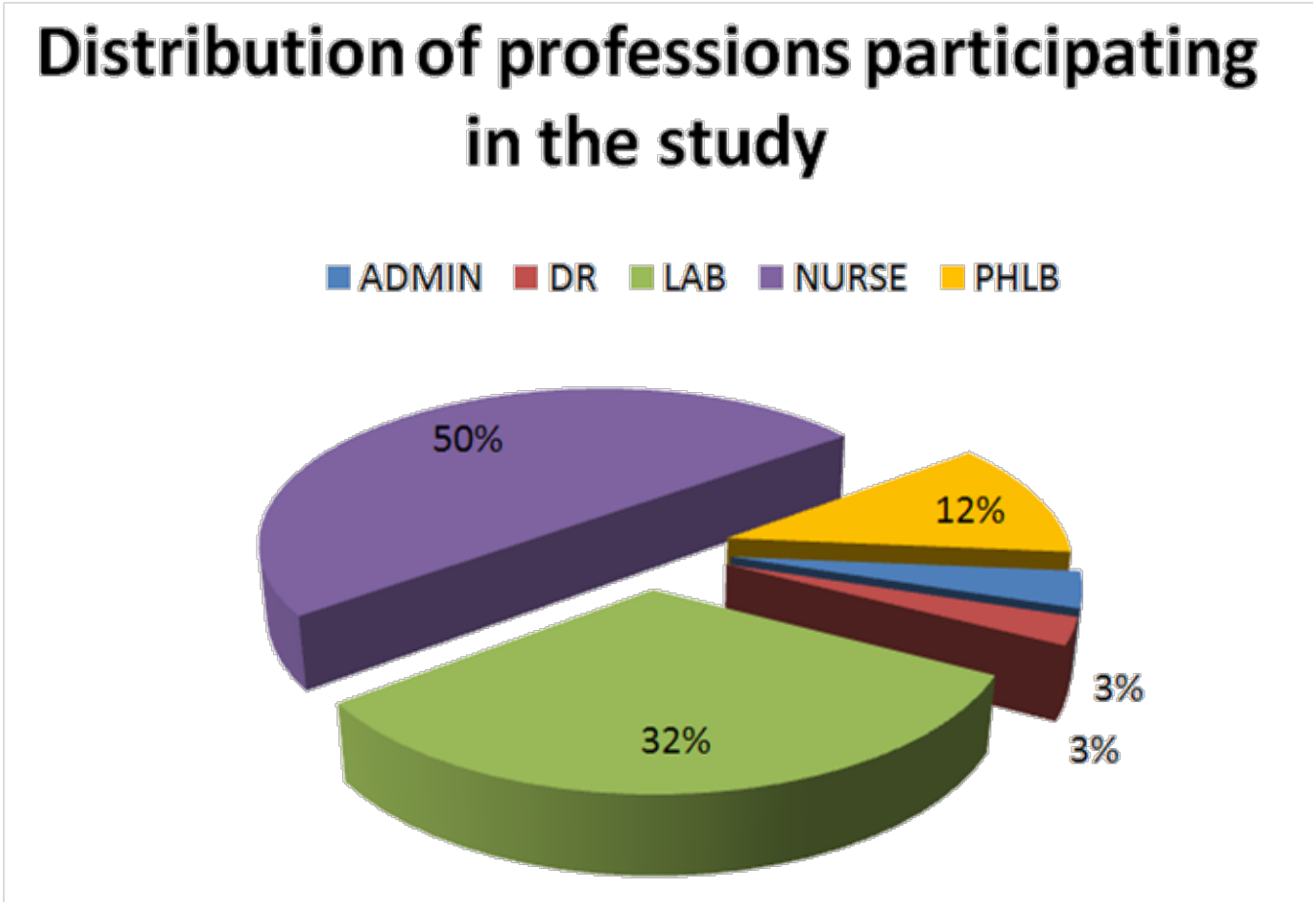

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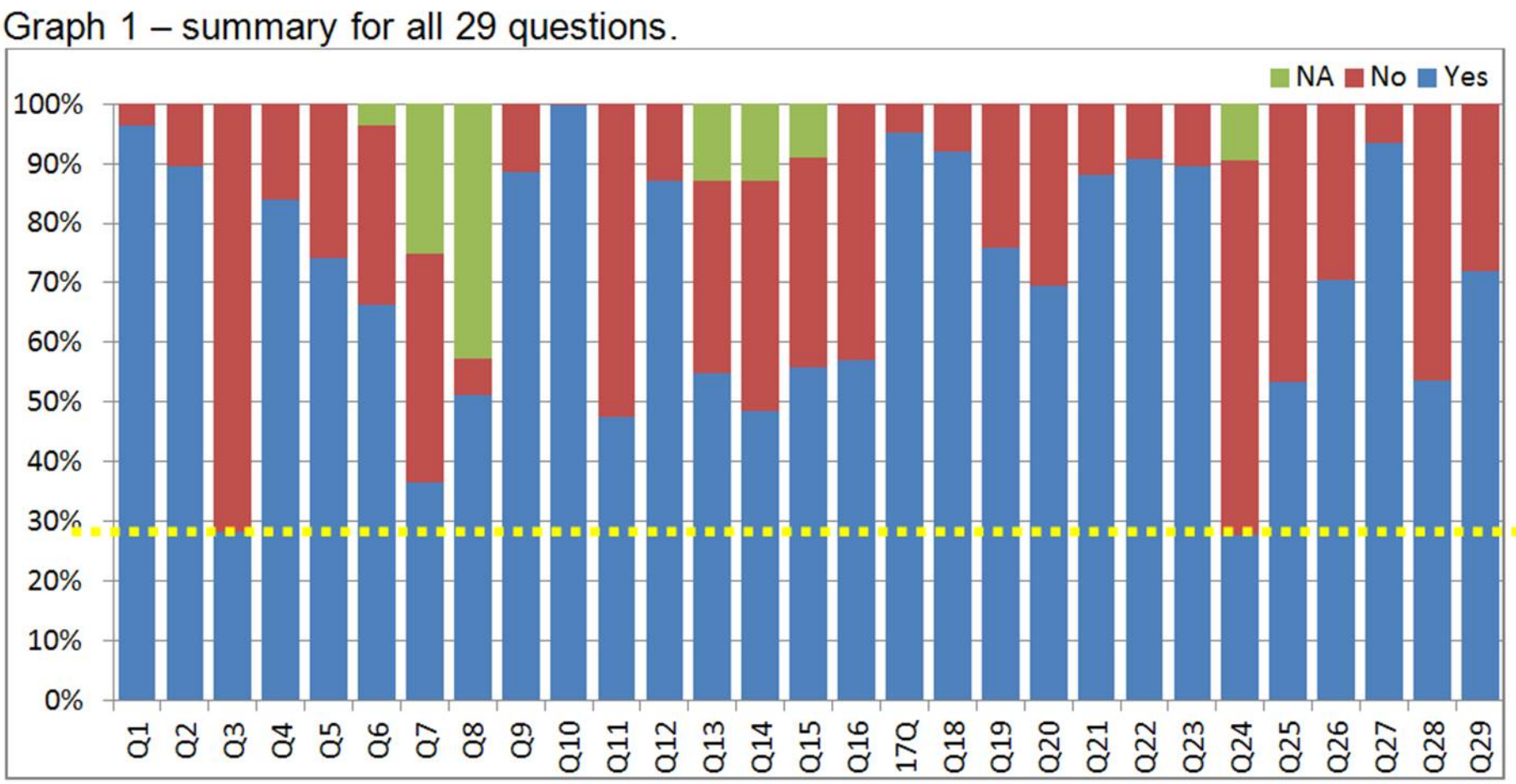
Compliance is poor…



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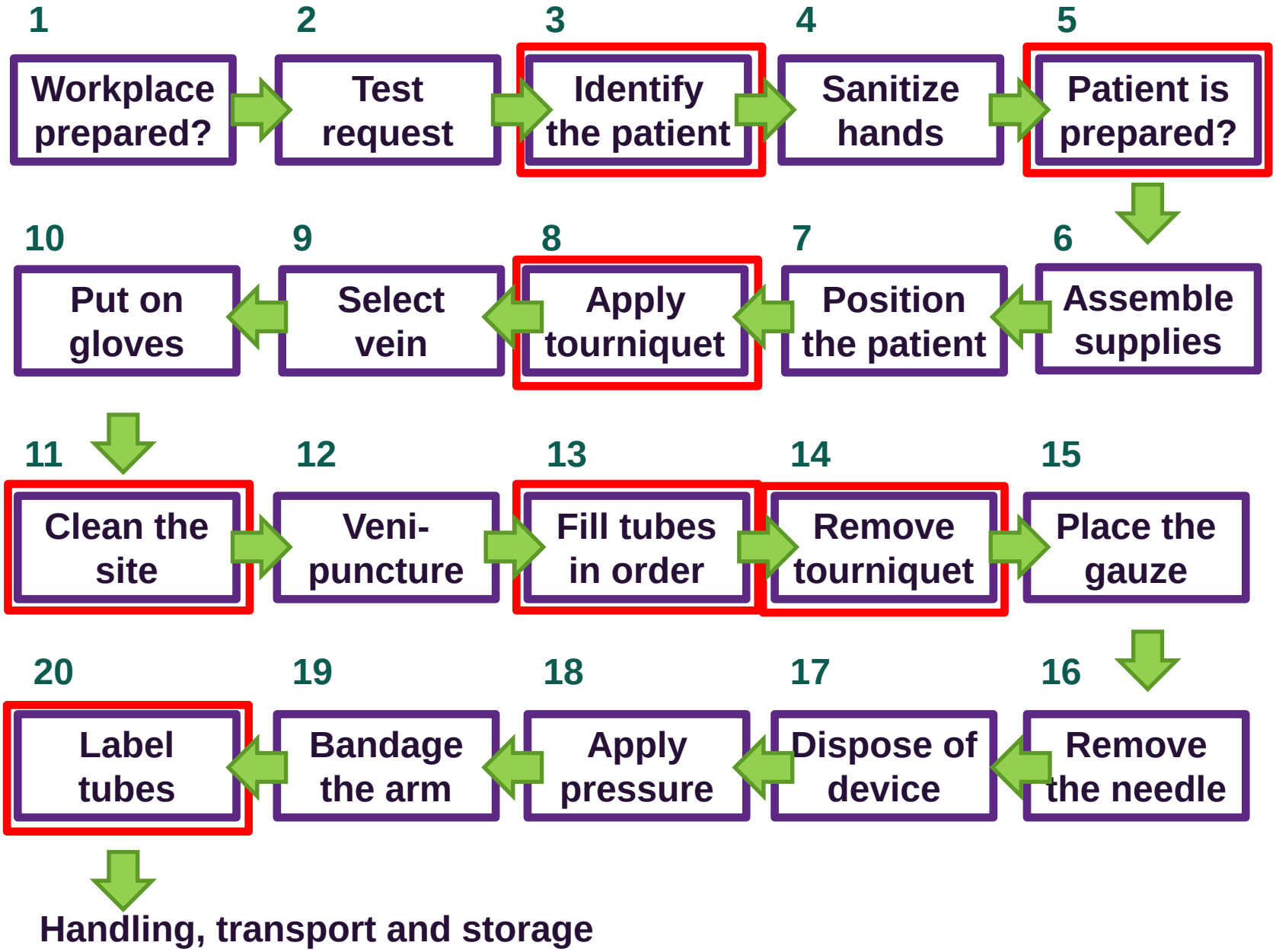
Case # 2

- 7:00 a.m.
- Patient is lying in his bed. Nurse arrives, asks a patient to sit upright in his bed, and draws one tube of blood. Serum proteins and cholesterol are requested.
- Was it correct to ask a patient to sit?

a) yes
b) no

How to do it properly?

CLSI GP41-A6 procedure



Venous blood sampling procedure

1

Workplace prepared?

Workplace prepared – plan ahead!

- Important to ensure **continuous workflow**
- **undisturbed** access to all necessary supplies.
- supplies should only be used until the declared **expiry date**.
- Necessary **materials**:
  - Written procedure
  - Alcoholic (ethanol, isopropyl alcohol) and non-alcoholic (benzine) disinfectants
  - Evacuated blood collection tubes with various additives and volumes
  - Different gauge size needles
  - Winged blood collection sets
  - Needle holders
  - Tourniquets
  - Cotton pads
  - Adhesive bandages or tapes
  - Gloves
  - Container for disposal of used needles after venipuncture
  - Ice water and water bath at 37 °C.
  - Foil

Venous blood sampling procedure

Identification errors

- ID errors are not rare!
  - 0.1-1% in laboratory medicine
  - 0.05% in transfusion medicine
- **underreported** (most go undetected)
- **major healthcare issue**
- potentially associated with serious **adverse consequences**
- **zero tolerance!**

Any potentially mislabeled or misidentified specimen should be rejected.

Lippi G, et al. Preanalytical quality improvement: from dream to reality. CCLM 2011;49(7):1113–1126

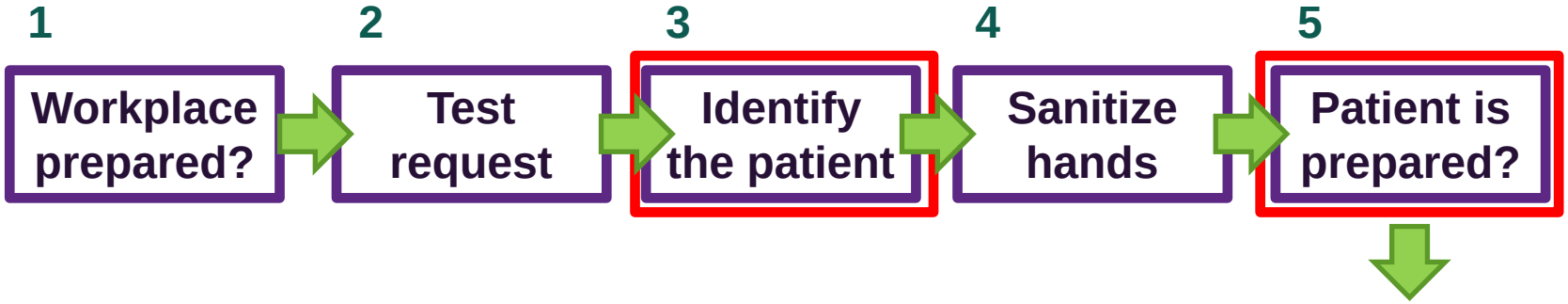
CLSI GP33-A Accuracy in Patient and Sample Identification

- first **introduce yourself** to the patient
- **at least two** acceptable unique patient identifiers
  - full name
  - assigned ID number
  - date of birth
  - photo ID on goverment issued ID card (driver' s licence)
  - any other person specific identifier
- **active** ID (engaging the patient)
- **open ended question** (and check with sample label and request form):
  - what is your name?
  - what is your date of birth?

CLSI GP33-A Accuracy in Patient and Sample Identification

If any discrepancies are identified
do not collect samples
until issues are resolved!

Venous blood sampling procedure



CLSI GP41-A6

- Verify patient diet restriction and latex sensitivity
  - Some tests require the patient to fast
  - Time and restriction vary according to the test
  - Restrictions are necessary to ensure accurate results
  - Diet restrictions should be in accordance to the institutional policy
  - For latex sensitivity – ask a patient and do not use latex gloves if a patient has a latex sensitivity

Fasting?
Diet restrictions ?

Original papers

Are patients well informed about the fasting requirements for laboratory blood testing?

Sanja Kackov[1*], Ana-Maria Simundic[2], Ani Gatti-Drnic[3]

[1]Medical biochemistry laboratory, Policlinic Bonifarm, Zagreb, Croatia
[2]University Department of Chemistry, Medical School University Hospital Sestre Milosrdnice, Zagreb, Croatia
[3]Medical biochemistry laboratory, Public Health Centre Zagreb-Centar, Zagreb, Croatia

Biochemia Medica 2013;23(3):326–31

- Survey, primary care medical laboratory
- Results:
  - Many patients **do not come properly prepared** for laboratory testing.
  - **Patients are not well informed** about the fasting requirements for laboratory blood testing

Patient is properly prepared?

- Consider:
  - Fasting
  - Physical activity
  - Medication
  - Test-specific requirements

Fasting definition

☹

Table 1. Evaluation of articles published in relevant journals in 2002.

Journal	Articles with a group of fasting patients,[a] n	Well-defined fasting, n (%)	Insufficient definition, n (%)	No definition, n (%)
Clinical Chemistry	20	1 (5)	5 (25)	14 (70)
Clinical Chemistry and Laboratory Medicine	24	0 (0)	6 (25)	18 (75)
Scandinavian Journal of Clinical and Laboratory Investigation	18	3 (17)	4 (22)	11 (61)
Diabetes	94	7 (7)	36 (38)	51 (54)

[a] If the term "fasting patient" was used in the Materials and Methods, Results, or Discussion, the publication was considered as using fasting patients.

Nybo M, Grinsted P, Jørgensen PE. Blood sampling: is fasting properly defined? Clin Chem 2005;51:1563-4.

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Peer-reviewed Patient-centered Outcomes-driven

☹

Table 1
Recommendations available at several national LTO Internet sites for fasting requirements for some serum/plasma blood tests.

	Glucose	ALP	Triglycerides
USA	8 h fast is recommended (nothing to eat or drink except water)	Fasting is preferred but not required for this test.	9–12 h fasting is recommended (only water is permitted, alcohol should not be consumed for 24 h before the test)
UK	8 h fast is recommended	Fasting is preferred but not required for this test	9–12 h fasting is recommended (only water is permitted, alcohol should not be consumed for 24 h before the test)
Australia	8–10 h fast is recommended	Fasting overnight is recommended[a]	10–16 h fasting is recommended (only water is permitted, alcohol should not be consumed for 24 h before the test)
Germany	12 h fast is recommended	Fasting overnight is recommended[a]	12–14 h fasting is recommended (only water is permitted, alcohol should not be consumed for 24 h before the test)
Czech Republic	8–10 h fast is recommended	Fasting is recommended	12–14 h fasting is recommended (only water is permitted, alcohol should not be consumed for 24 h before the test)
Italy	8 h fast is recommended (nothing to eat or drink except water)	No requirements	8 h fast is recommended.

[a] Eating a meal can increase alkaline phosphatase (ALP) slightly for a few hours in some people.

Simundic AM, et al. Standardization of collection requirements for fasting samples: for the Working Group on Preanalytical Phase (WG-PA) of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM). Clin Chim Acta. 2014;432:33-7.

Clinica Chimica Acta 432 (2014) 33–37

Contents lists available at ScienceDirect

Clinica Chimica Acta

journal homepage: www.elsevier.com/locate/clinchim

Standardization of collection requirements for fasting samples For the Working Group on Preanalytical Phase (WG-PA) of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM)

A.M. Simundic [a,b,*], M. Cornes [b,c], K. Grankvist [b,d], G. Lippi [b,e], M. Nybo [b,f]

- Blood for all blood tests should be drawn preferably in the morning from 7 to 9 a.m.
- Fasting should last for 12 h, during which water consumption is permitted.
- Alcohol should be avoided for 24 h before blood sampling.
- In the morning before blood sampling, patients should refrain from cigarette smoking and caffeine containing drinks (tea, coffee, etc.).

Simundic AM, et al. Standardization of collection requirements for fasting samples: for the Working Group on Preanalytical Phase (WG-PA) of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM). Clin Chim Acta. 2014;432:33-7.

Implementation and compliance

- Laboratories should implement **standardized procedure** for patient preparation.
- Laboratories should have policies for **sample acceptance criteria**
- **Do not take blood** if patient is not appropriately prepared.
- Laboratory professionals are responsible for **disseminating information** about fasting requirements to **patients** as well as to **clinicians** and **general practitioners** who are the preferred source of information for patients.

- *EFLM WG-PRE is working on the recommendation for patient preparation which will also include other variables*

Simundic AM, et al. Standardization of collection requirements for fasting samples: for the Working Group on Preanalytical Phase (WG-PA) of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM). Clin Chim Acta. 2014;432:33-7.

Case # 1 - results

- 7:30 a.m.
- Patient arrives to the laboratory outpatient unit. His last meal was at 21:00 on the previous day. In the morning he had coffee with milk (without sugar) and one cigarette. Routine chemistry and hematology tests are requested. Is this patient properly prepared for blood tests?

a) Yes

b) No ✓

Medication, test specific requirements

All	Patient position	Were you resting for 15 minutes prior to blood sampling?	If patient is excited and is not rested prior to blood sampling, increased production of hormones (i.e. catecholamines and corticosteroids) can alter concentration of a large number of proteins, lipids and carbohydrates (26).
Coagulation tests	Therapy	Are you receiving any kind of anticoagulant therapy?	PT INR should be measured prior to taking OAT. Also, thrombophilia screening tests (LAC, protein C, protein S, APCR) cannot be performed if the patient is already receiving OAT (28).
Female hormones	Menstrual cycle	What is the current day of your menstrual cycle?	Concentration of female hormones depends on the day of the menstrual cycle (26).
Homocysteine	Dietary habits	Are you fasting for 12 hours? Did you have protein-rich meal within last 48 hours?	Protein-rich meals can cause falsely elevated homocysteine concentration (29).
Iron	Therapy	Were you receiving any oral or intravenous supplements containing iron within the last 10 days?	Consumption of iron supplements or too little time after discontinuing of taking those preparations causes falsely elevated iron concentration (26).

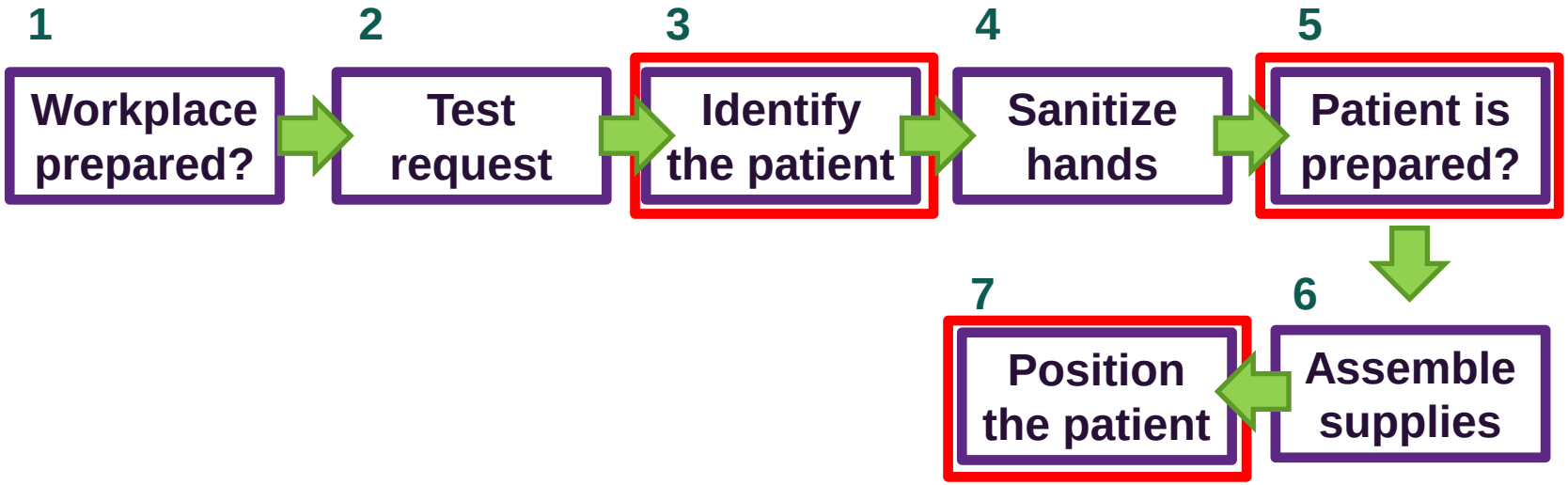
Nikolac N, Supak-Smolcic V, Simundic AM, Celap I. Croatian Society of Medical Biochemistry and Laboratory Medicine: national recommendations for venous blood sampling. Biochem Med 2013;23(3):242-54.

Medication, test specific requirements

Postprandial glucose	Therapy	Do you have your usual therapy with you (i. e. insulin or oral hypoglycaemics)?	When performing measurement of postprandial glucose, the patient should simulate an everyday meal and therapy regime. If receiving oral hypoglycaemics, the patient should take their meal and therapy after sampling for fasting glucose has been done. Deviation from the usual protocol can cause variations in the result of the test (31).
Therapeutic drug monitoring	Therapy	When did you take last dose of the drug? What is the name of the drug you are receiving?	Therapeutic drug monitoring should be done after the drugs are at a steady state and blood collection performed immediately prior to taking the next dose of the drug (32). The time of the application of the previous dose will help to interpret results of the test. Errors in interpretation can occur if the sample is obtained at the wrong time (33).
Thyroid hormones (T4, free T4)	Therapy	When did you take last dose of levothyroxine?	Levothyroxine should not be taken in the morning before blood sampling is done, since hormones cause falsely elevated concentration of T4/freeT4 (34).

Nikolac N, Supak-Smolcic V, Simundic AM, Celap I. Croatian Society of Medical Biochemistry and Laboratory Medicine: national recommendations for venous blood sampling. Biochem Med 2013;23(3):242-54.

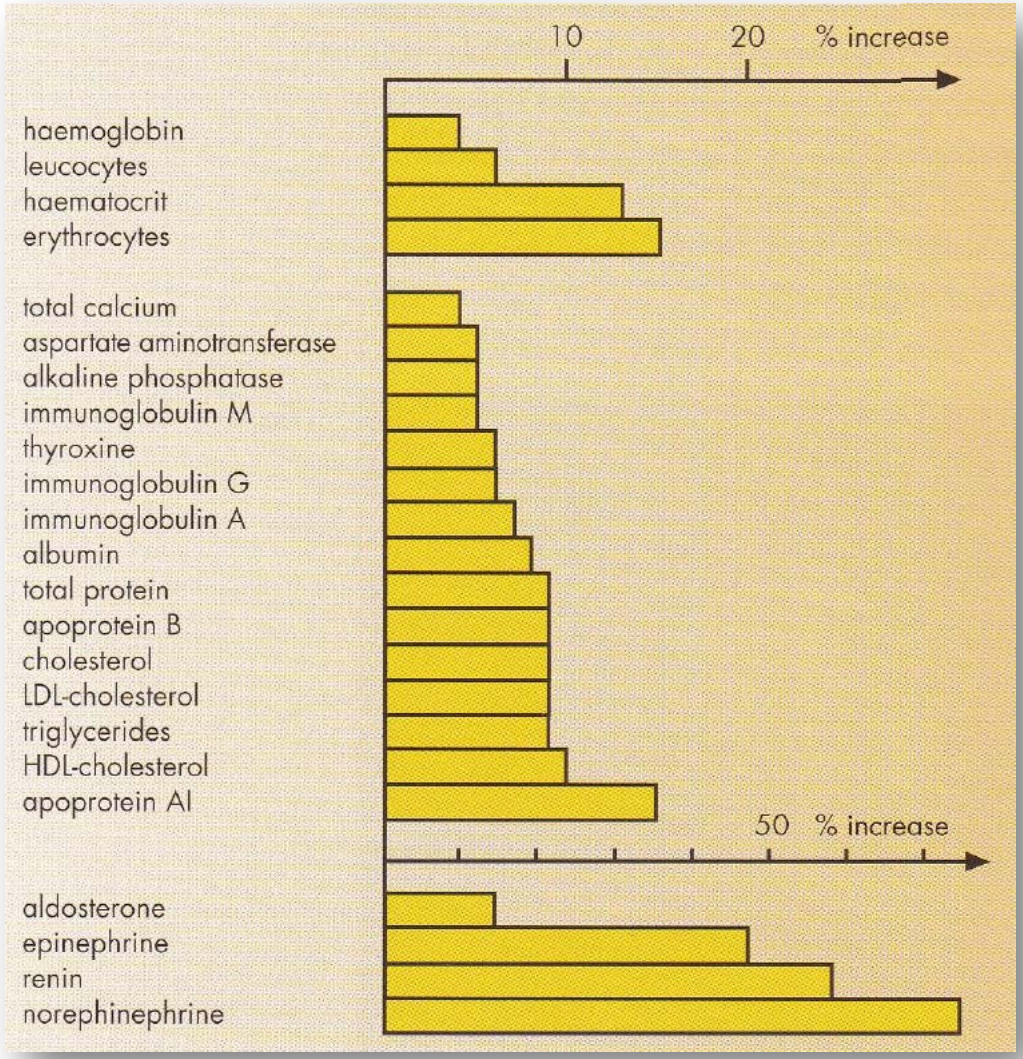
Venous blood sampling procedure

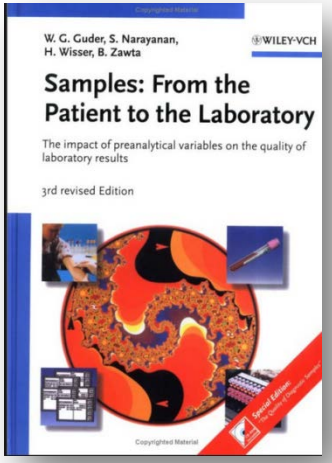


CLSI GP41-A6

- Patient should be sitting in a comfortable chair with arms to provide suport in case the patient faints
- If necessary, patient may lie down
- Do not change position before blood sampling!

Change from supine to upright position





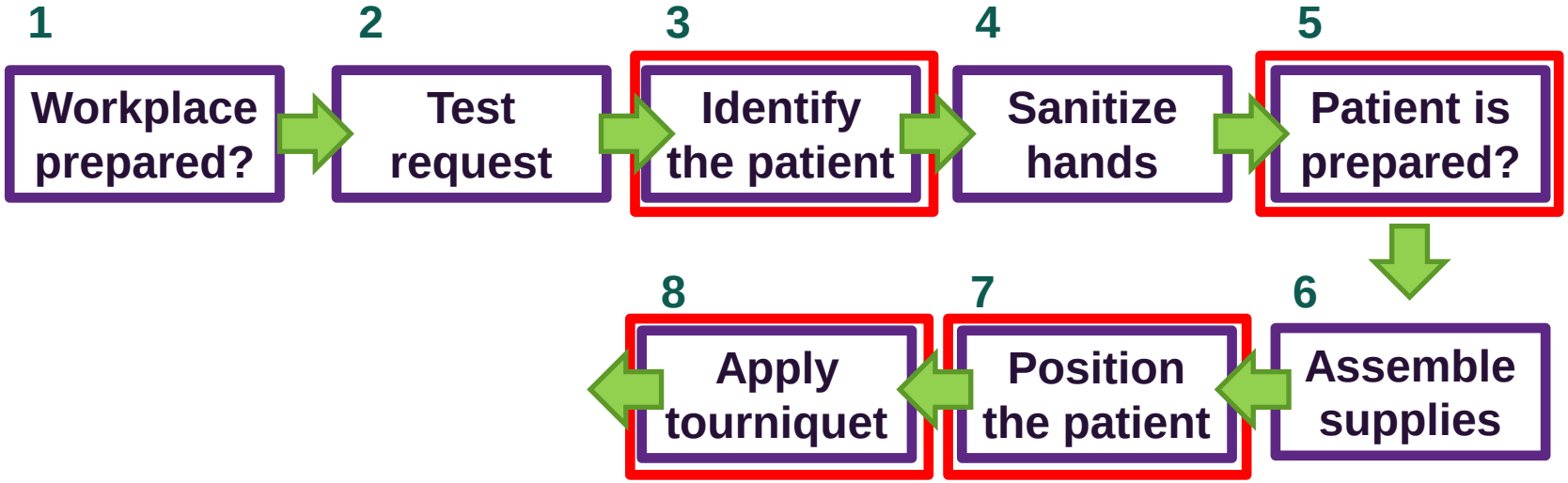
Guder WG, Narayanan S, Wisser H, Zawta B. Samples: From the Patient to the Laboratory. 2003, 3rd ed

Case # 2 - results

- 7:00 a.m.
- Patient is lying in his bed. Nurse arrives, asks a patient to sit upright in his bed, and draws one tube of blood. Serum proteins and cholesterol are requested.
- Was it correct to ask a patient to sit?

a) yes
b) No ✓

Venous blood sampling procedure

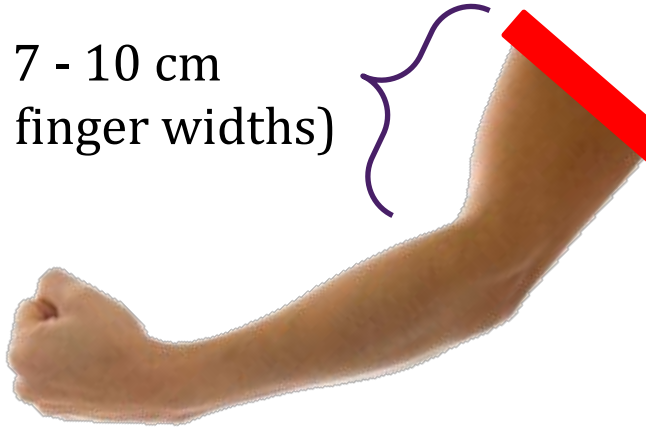


Apply a tourniquet

- increases intravascular pressure and makes veins more visible
  - To avoid damaging of local arteries and nerves by venipuncture.
- ≤ 1 minute (to avoid local hemoconcentration and false increase in proteins, cells and hematocrit)
- If ≥ 1 minute, release and reapply after 2 min

- Patient can form a fist (to make veins more visible).
- Pumping (fist clenching) should not be done!

- Do not apply tourniquet for:
  - lactate, ammonia, albumin and calcium
- Tourniquets are source of MRSA
  (Through poor hand hygiene. Therefore use single-use devices!)



Fist clenching

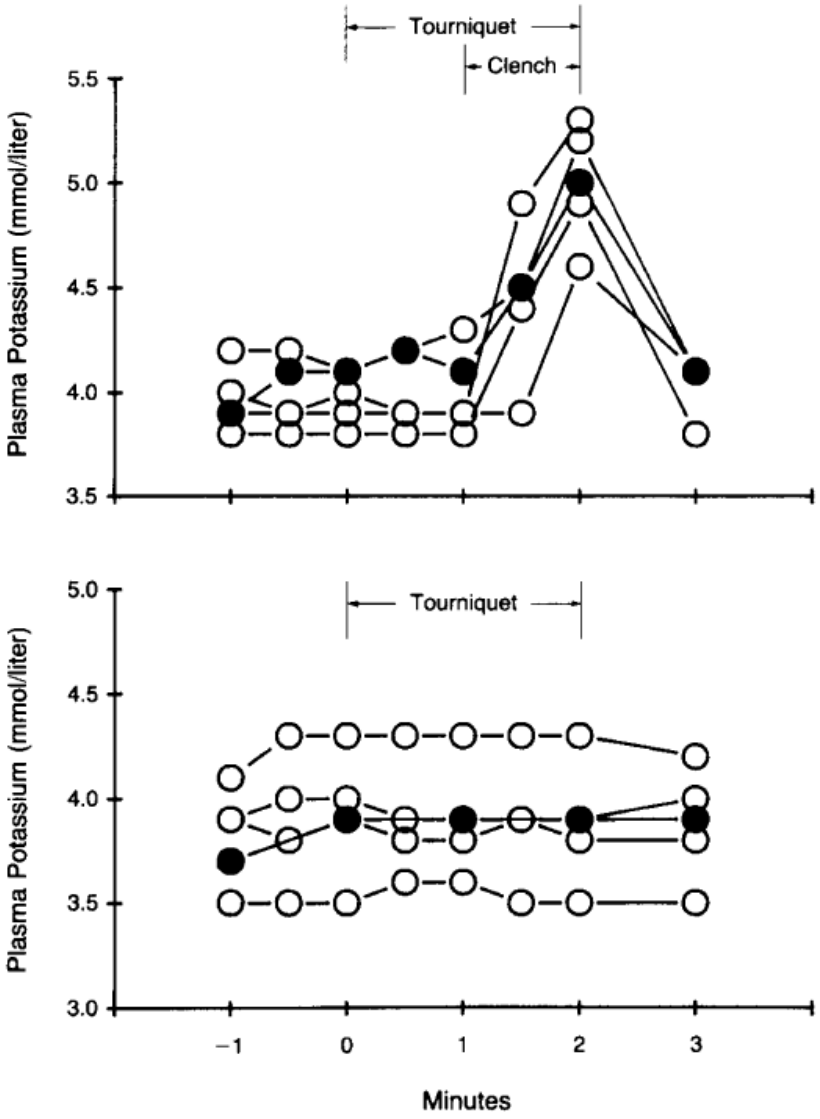


Figure 1. Effects of the Application of a Tourniquet plus Fist Clenching (Upper Panel) and Tourniquet Alone (Lower Panel) on Plasma Potassium Concentrations.

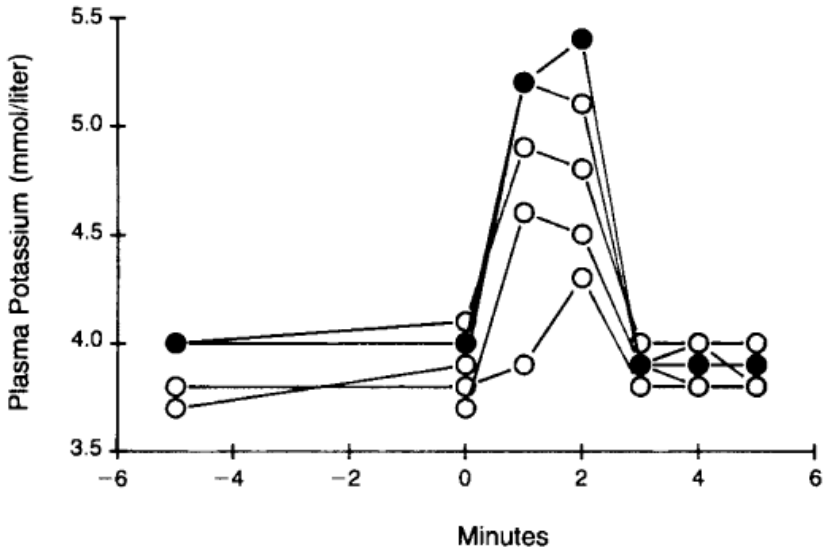
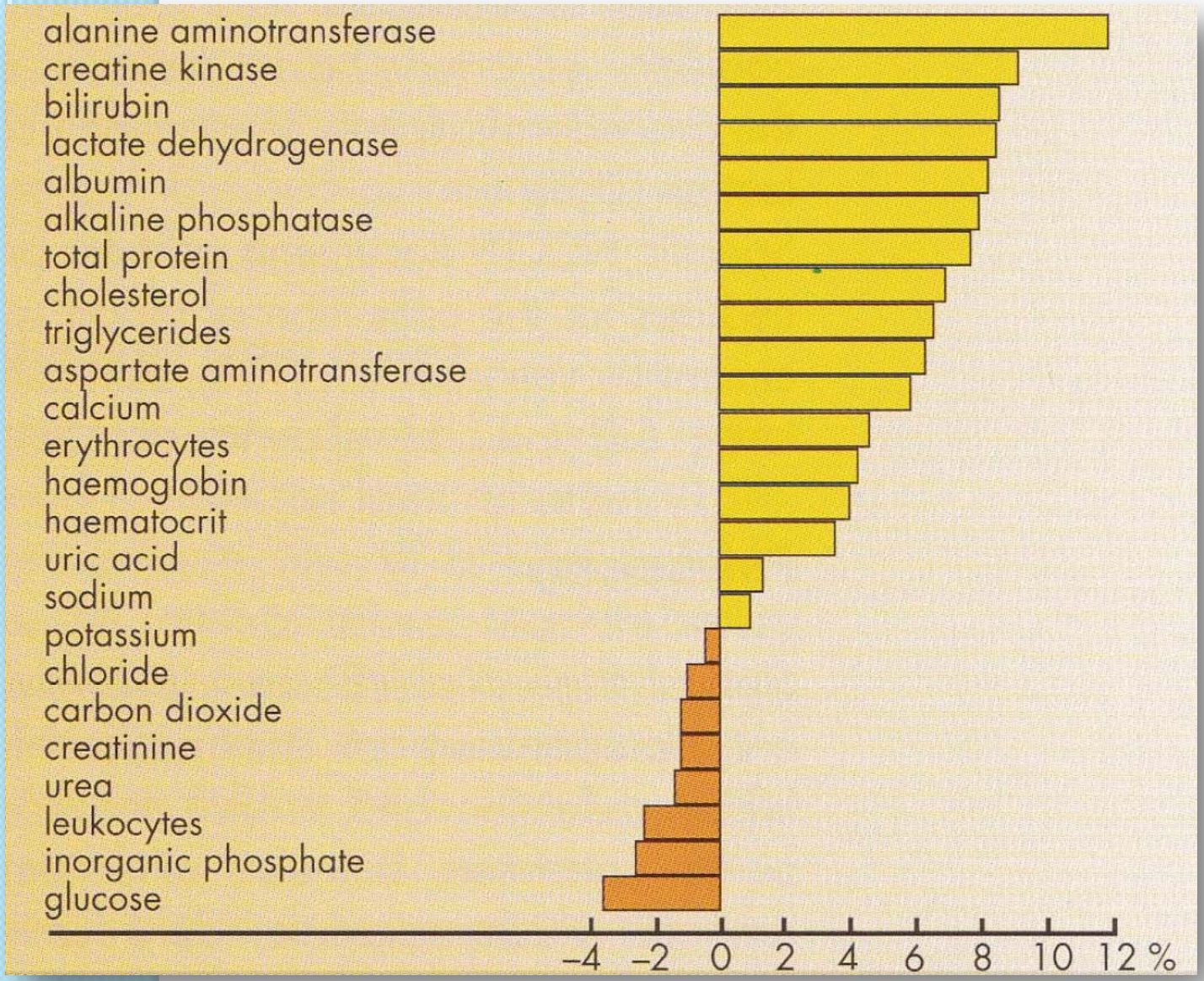


Figure 2. Effect of Handgrip Exercise on Plasma Potassium Concentrations.

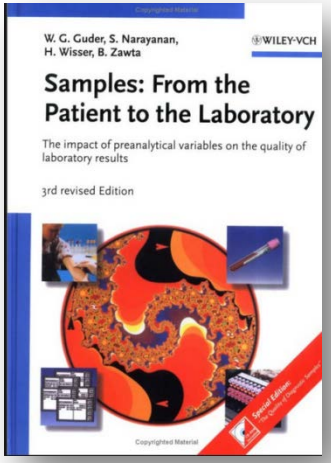
- Fist clenching leads to the increase of **potassium** !!

Don BR, Sebastian A, Cheitlin M, Christiansen M, Schambelan M. Pseudohyperkalemia caused by fist clenching during phlebotomy. N Engl J Med 1990;322(18):1290-2.

Prolonged tourniquet application



- Fluid and small molecules shift to the extravascular space
- ↑ Concentration of high molecular compounds
- If combined with a fist clenching – increase in K+!!!



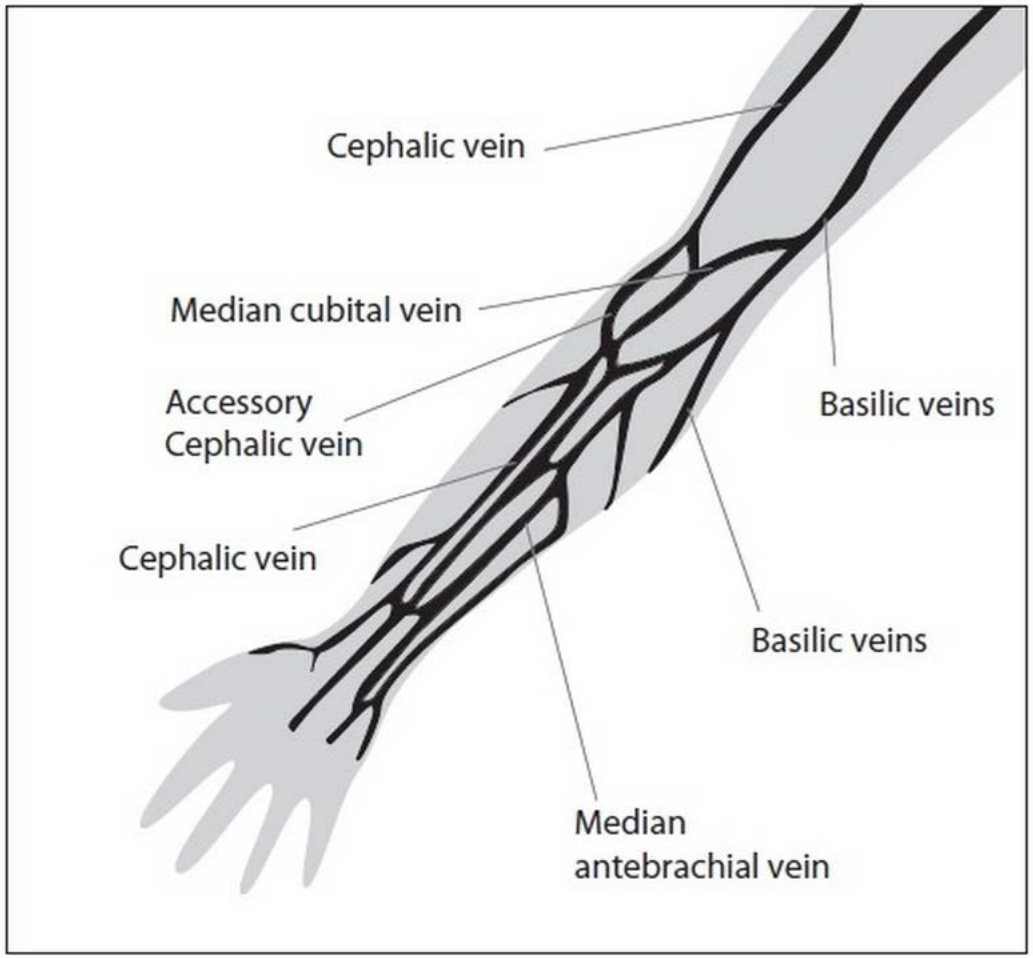
Guder WG, Narayanan S, Wisser H, Zawta B. Samples: From the Patient to the Laboratory. 2003, 3rd ed

Transillumination devices

- Hand-held devices
- based on cold near infrared light-emitting diodes (LEDs) whose light is absorbed by Hb (in erythrocytes)
- suitable for small children
- also proposed for mapping veins to be cannulated

Lima-Oliveira G, et al. New ways to deal with known preanalytical issues: use of transilluminator instead of tourniquet ***for easing vein access*** *and* ***eliminating stasis*** *on clinical biochemistry. Biochem Med 2011;21(2):152-9.*

Select a vein

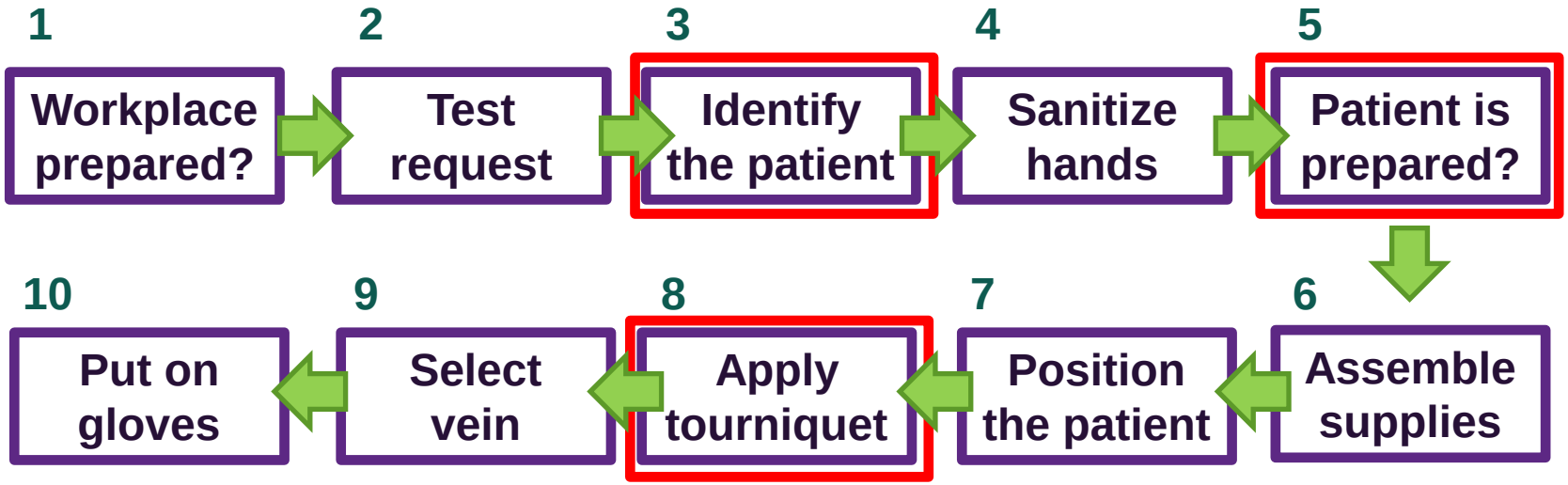


Veins of the Forearm.

- Selecting the best vein for venipuncture is important:
  - sample quality,
  - patient satisfaction,
  - to avoid nerve damage,
  - to avoid arterial puncture,
  - workflow (productivity)

Nikolac N, Supak-Smolcic V, Simundic AM, Celap I. Croatian Society of Medical Biochemistry and Laboratory Medicine: national recommendations for venous blood sampling. Biochem Med 2013;23(3):242-54.

Venous blood sampling procedure



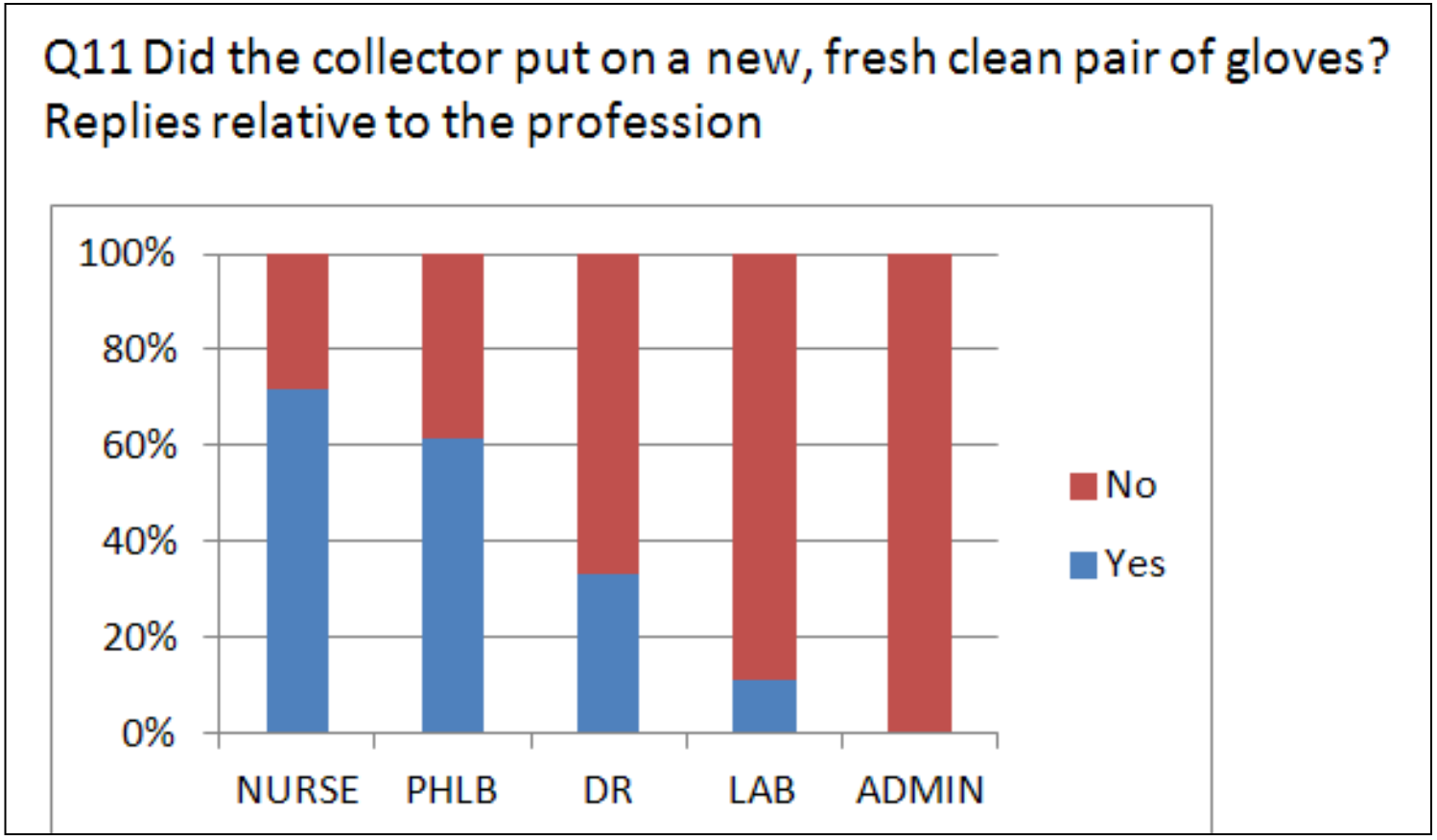
Put on gloves – when?

- CLSI GP41-A6 guideline recommends putting gloves on **after** applying tourniquet.
- there is evidence that the time of tourniquet application on patient's hand is **> 1 min** *(if you follow CLSI procedure)*
- to reduce prolonged blood stasis Lima-Oliveira et al suggest:

  "*... we propose putting on gloves **prior** to tourniquet application*."

Lima-Oliveira G, et al. Impact of the phlebotomy training based on CLSI/NCCLS H03-A6 – procedures for the collection of diagnostic blood. Biochemia Medica 2012;22(3):342-51.

Are you putting on gloves?



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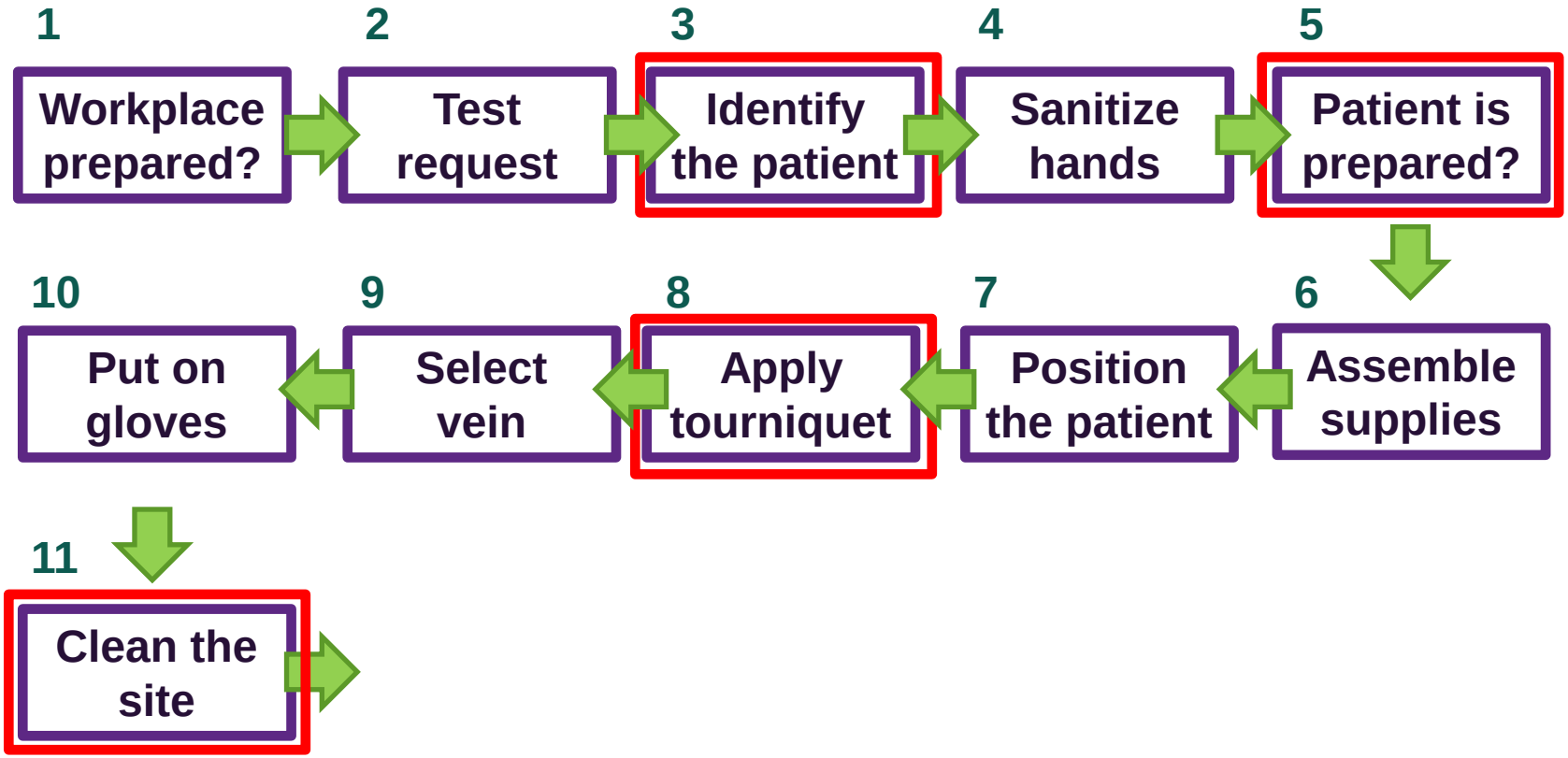
Venous blood sampling procedure



Clean the venipuncture site

- CLSI GP41-A6 guideline recommends that the puncture site must be cleaned to prevent contamination of a patient or a sample
- 70% ethyl alcohol
- Site should be allowed to dry for at least 30 seconds
  - To prevent hemolysis
  - To prevent burning sensation of a patient during puncture
  - To allow antiseptic effect of alcohol

Original papers

Avoidance to wipe alcohol before venipuncture is not a source of spurious hemolysis

Gian Luca Salvagno[1], Elisa Danese[1], Gabriel Lima-Oliveira[1,2], Gian Cesare Guidi[1], Giuseppe Lippi*[3]

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[2]Post-Graduate Program of Pharmaceutical Sciences, Department of Medical Pathology Federal University of Parana, Curitiba, Parana, Brazil
[3]Laboratory of Clinical Chemistry and Hematology, Academic Hospital of Parma, Parma, Italy

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Abstract

Background: It is still uncertain whether or not avoidance to let disinfectant alcohol dry at the site of venipu
when drawing venous blood.

Methods: In a consecutive series of 52 outpatients referred f
(odd group) or without (pair group) wipi
parator was drawn f
between groups. As regards
whom blood was drawn with or without letting
the conventional sample rejection threshold of cell-free hemoglobin.

ized study attest that failure to wipe alcohol at the site of venipuncture should not be conside-
rous hemolysis when drawing blood.

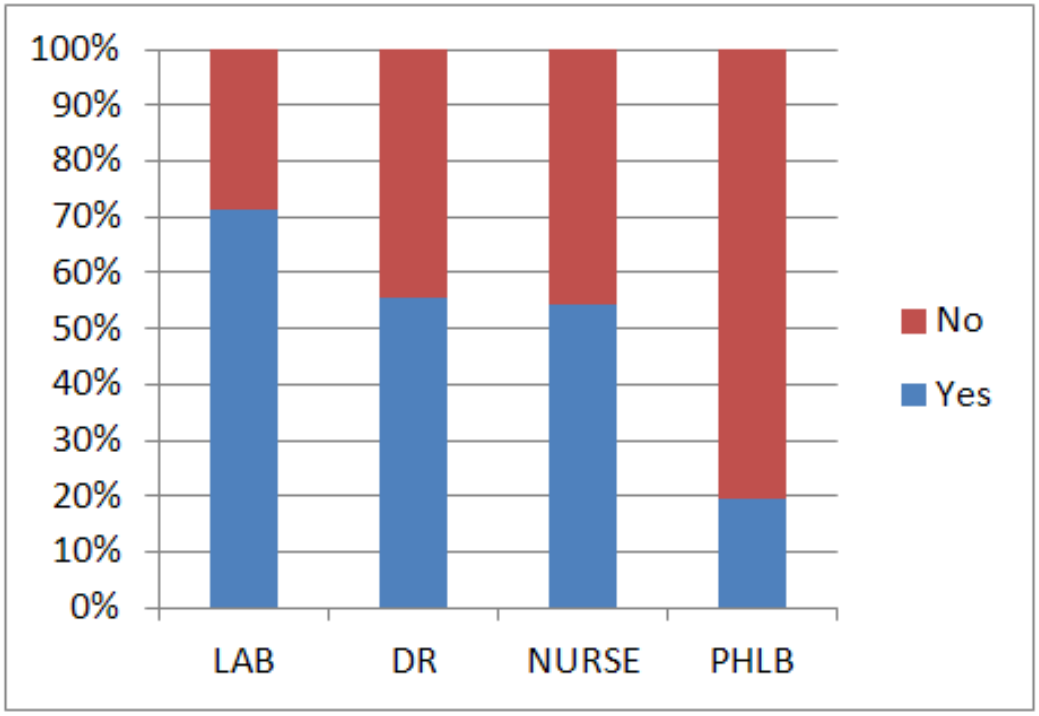
Key words: preanalytical variability; hemolysis; alcohol; practice guideline

FAILURE TO LET ACOHOL TO DRY IS NOT ASSOCIATED WITH SAMPLE HEMOLYSIS

Salvagno GL, Danese E, Lima-Oliveira G, Guidi GC, Lippi G. Avoidance to wipe alcohol before venipuncture is not a source of spurious hemolysis. Biochem Med 2013;23(2):201-5.

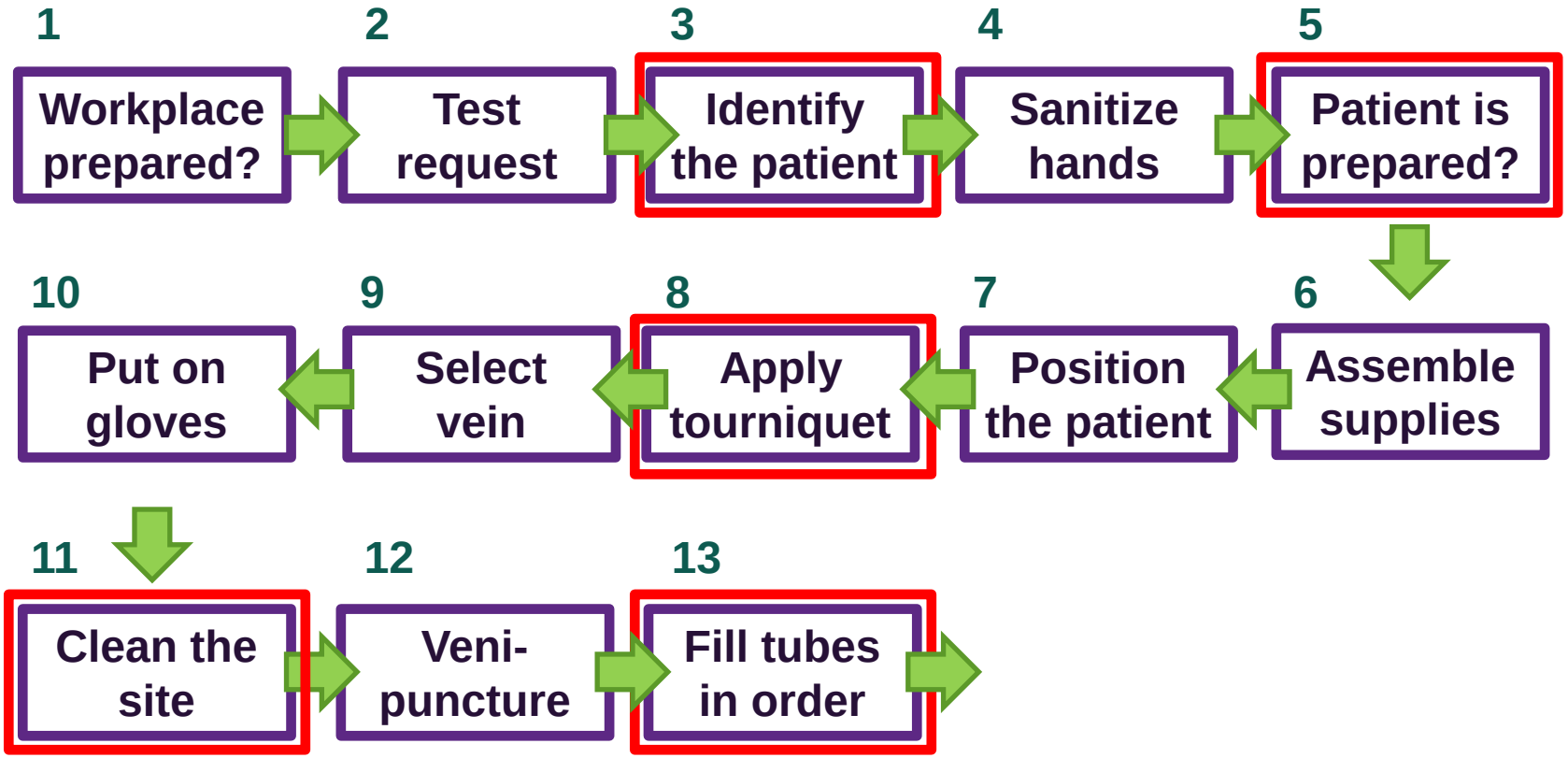
Do not touch the site after cleaning it!

Q14 Did the collector leave the venipuncture site untouched post cleaning?
Replies relative to the profession



Simundic AM, et al. Compliance of blood sampling procedures with the CLSI H3-A6 guidelines: An observational study by the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) working group for the preanalytical phase (WG-PRE). CCLM 2014, e-pub ahead of print

Venous blood sampling procedure



Case # 3

- Nurse needs to take EDTA, serum and citrate tube from a patient. Which is the correct order of draw?

a) Coagulation (citrate)
EDTA
Serum

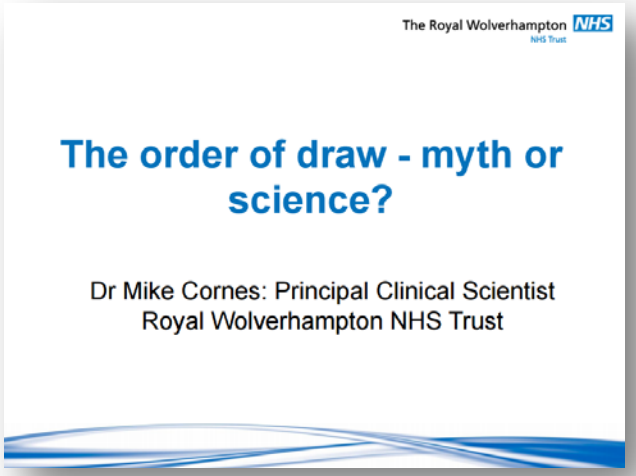
b) EDTA
Coagulation (citrate)
Serum

c) Coagulation (citrate)
Serum
EDTA

d) The order of draw does not matter. It is not important.

Order of draw

- Important to:
  - assure sample quality
  - avoid cross-contamination of additives between tubes
- Evidence shows that it occurs and may affect the quality of results



http://www.preanalytical-phase.org/porto2015

Sample cross-contamination

- With sodium citrate / Na-EDTA
  - ↑↑ Na
- With K-EDTA
  - ↑↑ K
  - ↓↓ Ca, Mg, Zn
- With anticoagulants
  - Poor coagulation

www.orderofdraw.com

CLSI GP41-H6 recommends following order of draw:

- Blood culture
- Coagulation (citrate)
- Serum tube
- Heparin tube
- EDTA
- Glucose inhibitor (NaF)

Case # 3 - results

- Nurse needs to take EDTA, serum and citrate tube from a patient. Which is the correct order of draw?

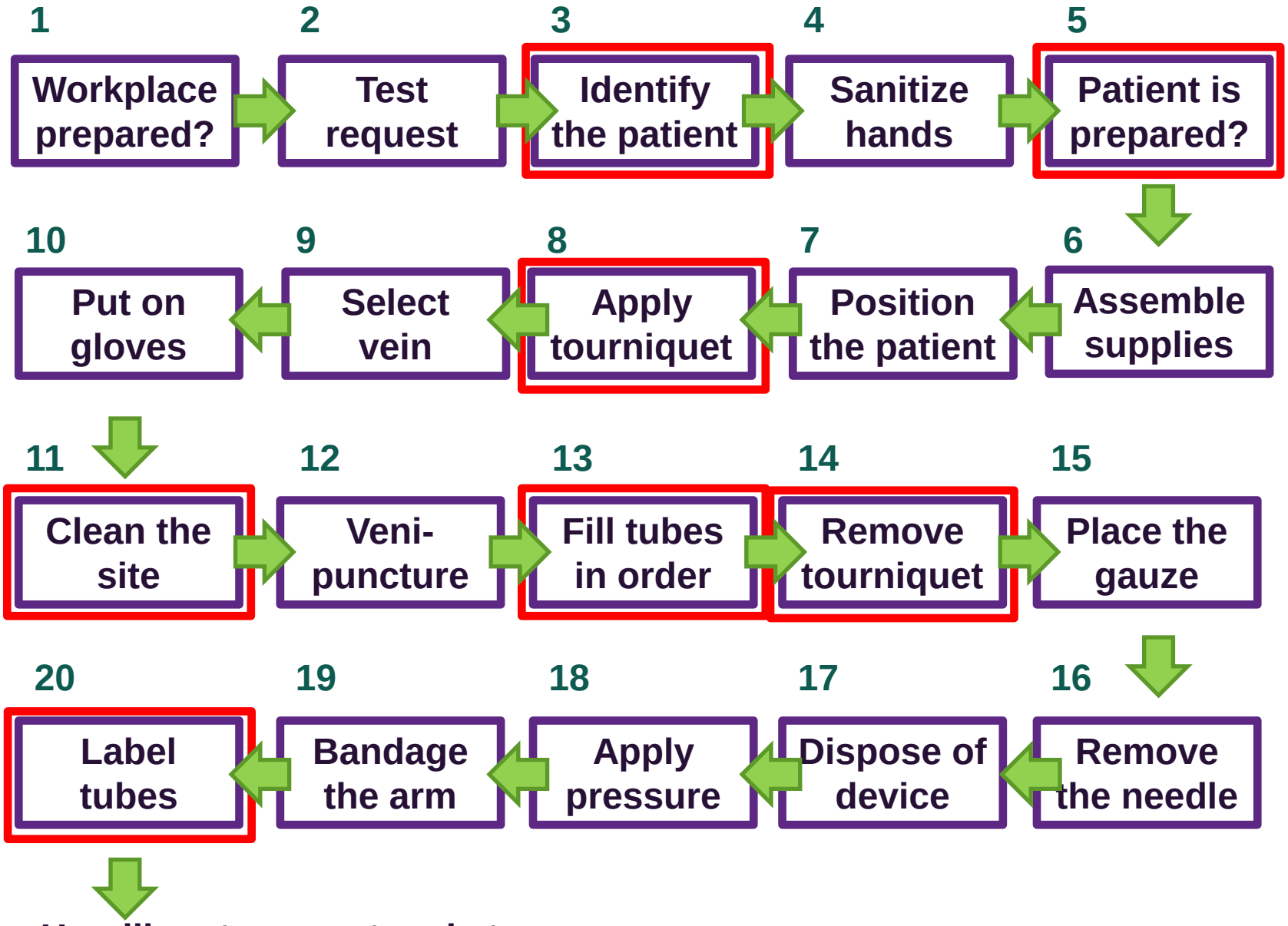
a) Coagulation (citrate)
EDTA
Serum

b) EDTA
Coagulation (citrate)
Serum

c) Coagulation (citrate)
Serum
EDTA

d) The order of draw does not matter. It is not important.

Venous blood sampling procedure

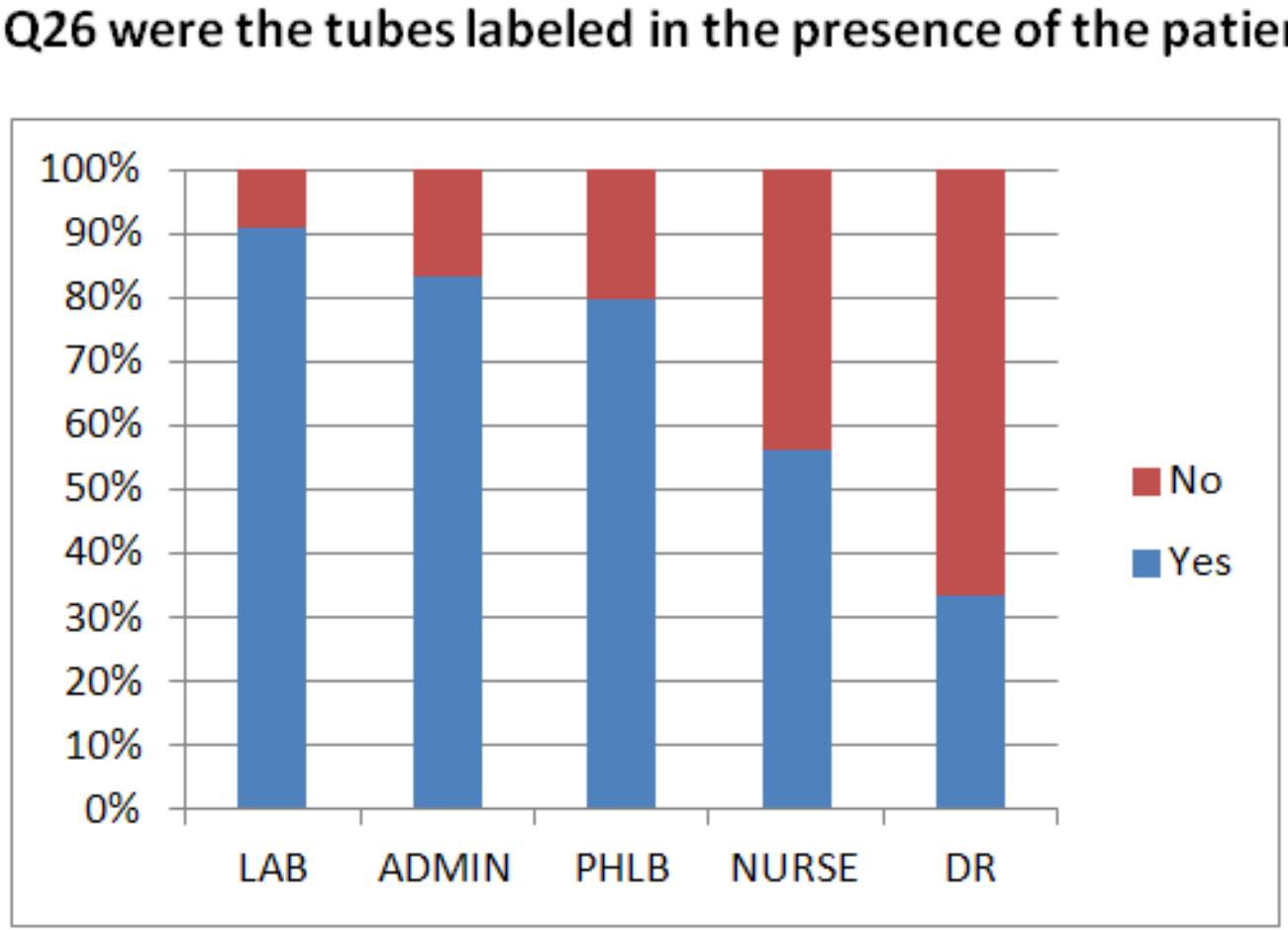


Tube labelling

- According to CLSI GP41-A6
  - tubes should be labelled **after** the blood sampling, but:
    - at the time and site of collection
    - in the presence of the patient
  - tube label should <u>at least</u> contain:
    - Patient first and last name
    - ID number
    - Date
    - Time (if necessary, like for TDM)
    - ID of the phlebotomist

      (or there should be a mechanism to identify a phlebotomist)

Tube labelling errors…



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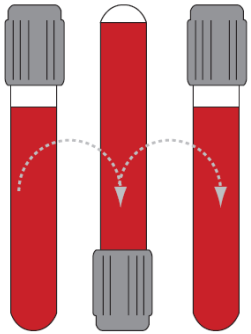
Handling, transport and storage

- Mixing!
  - For mixing see manufacturers instructions
- Chilling
  - Ammonia, lactate, gastrin, PTH, glucose (ADA)
- Protection from light
  - Porphyrins, vitamin A and B6, bilirubin (?)
- Keep at 37°C
  - Cold agglutinin, cryoglobulins



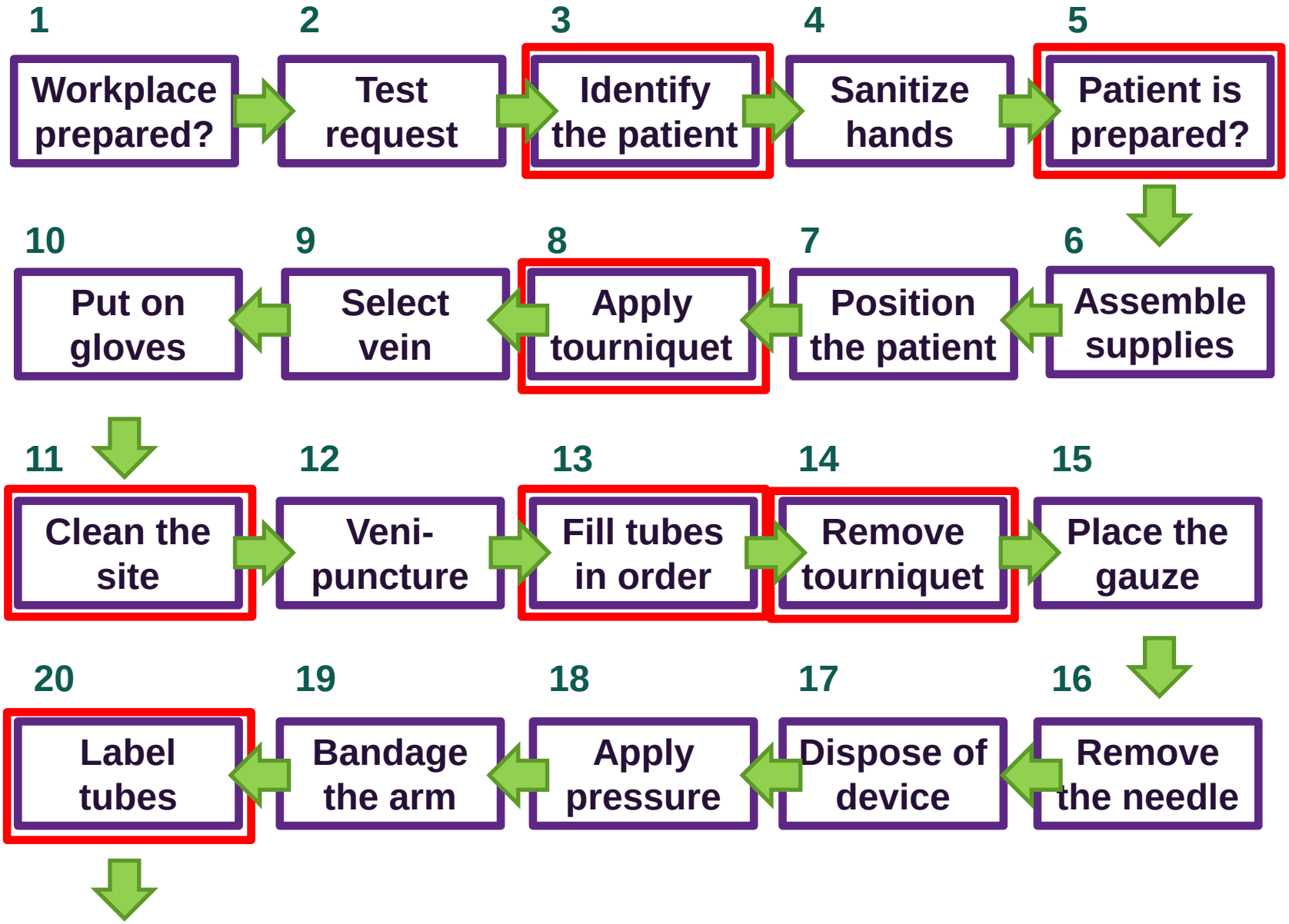
Nikolac N, Supak-Smolcic V, Simundic AM, Celap I. Croatian Society of Medical Biochemistry and Laboratory Medicine: national recommendations for venous blood sampling. Biochem Med 2013;23(3):242-54.

How to improve the quality of phlebotomy?

Improvement is possible through:

- Implementing the **phlebotomy guidelines**
- **Education** of all involved
- Consistently **enforcing compliance**
- **Monitoring performance**

Adopt and adapt the recommended procedure



Effects of educational interventions

- Education increases level of confidence and improves quality of procedures:
  - Effects are usually short-term
  - Education should be continuous, periodical

Bölenius K, et al. Impact of a large-scale educational intervention program on venous blood specimen collection practices. BMC Health Serv Res. 2013;13:463.

Lima-Oliveira G, et al. Impact of the phlebotomy training based on CLSI H03-A6-procedures for the collection of diagnostic blood specimens by venipuncture. Biochem Med 2012;22(3):342-51.

And…

- Monitoring (observational audits)
- Checklists
- Quality indicators

EFLM Checklist (29 items)

Question 1																
Did the collector assemble all necessary supplies prior to collection?	Yes	X	No			Yes	X	No			Yes	X	No			
Question 2																
Does the collector have an identified request form?	Yes	X	No			Yes	X	No			Yes	X	No			
Question 3																
Did the collector check the expiry dates of devices in use?	Yes		No	X		Yes		No	X		Yes		No	X		
Question 4																
Did the collector identify the patient according to CLSI or local guidelines	Yes	X	No			Yes	X	No			Yes	X	No			
Question 5																
Did the collector appropriately sanitize hands?	Yes		No	X		Yes		No	X		Yes		No	X		
Question 6																
Has the collector verified that the patient is properly prepared for phlebotomy?	Yes		No	X		Yes		No	X		Yes		No	X		
Question 7																
Was the chair used for venipunture specific to the task?	Yes	X	No		N/A		Yes	X	No		N/A		Yes	X	No		N/A	
Question 8																
If lying, did the collector ensure the arm was appropriately positioned?	Yes		No			Yes		No			Yes		No			
Question 9																
Did the collector place the tourniquet 4 finger widths (10cm) above the venipuncture site?	Yes	X	No			Yes	X	No			Yes	X	No			
Question 10																
Did the collector select a suitable venipuncture site according to standard pract	Yes	X	No			Yes	X	No			Yes	X	No			
Question 11																
Did the collector put on a new, fresh clean pair of gloves?	Yes		No	X		Yes		No	X		Yes		No	X		
Question 12																
Did the collector clean the venipuncture site?	Yes	X	No			Yes	X	No			Yes	X	No			
Question 13																
Did the collector leave the venipuncture site to dry (30secs)?	Yes	X	No			Yes	X	No			Yes	X	No			
Question 14																
Did the collector leave the venipuncture site untouched post cleaning?	Yes		No	X		Yes		No	X		Yes	X	No			

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Consensus conference

DE GRUYTER DOI 10.1515/cclm-2014-0142 — Clin Chem Lab Med 2014; aop

Opinion paper

Mario Plebani*, Michael L. Astion, Julian H. Barth, Wenxiang Chen, César A. de Oliveira Galoro, Mercedes Ibarz Escuer, Agnes Ivanov, Warren G. Miller, Penny Petinos, Laura Sciacovelli, Wilson Shcolnik, Ana-Maria Simundic and Zorica Sumarac

Harmonization of quality indicators in laboratory medicine. A preliminary consensus

- 22 preanalytical QI (+6 lower priority)

Preanalytical QI

Plebani M, et al. Harmonization of quality indicators in laboratory medicine. A preliminary consensus. CCLM 2014:52:951–8

Quality indicator	Reporting systems
Misidentification errors	Samples suspected to be from wrong patients
	a) Percentage of "Number of misidentified requests/Total number of requests"
	b) Percentage of "Number of misidentified samples/Total number of samples"
	c) Percentage of "Number of samples with fewer than 2 identifiers initially supplies/Total number of samples"
	d) Percentage of "Number of unlabeled samples/Total number of samples"
Test transcription errors	a) Percentage of "Number of outpatients requests with erroneous data entry (test name)/Total number of outpatients requests"
	b) Percentage of "Number of outpatients requests with erroneous data entry (missed test)/Total number of outpatients requests"
	c) Percentage of "Number of outpatients requests with erroneous data entry (added test)/Total number of outpatients requests"
	d) Percentage of "Number of inpatients requests with erroneous data entry (test name)/Total number of inpatients requests"
	e) Percentage of "Number of inpatients requests with erroneous data entry (missed test)/Total number of inpatients requests"
	f) Percentage of "Number of inpatients requests with erroneous data entry (added test)/Total number of inpatients requests"
Incorrect sample type	a) Percentage of "Number of samples of wrong or inappropriate type (i.e., whole blood instead of plasma)/Total number of samples"
	b) Percentage of "Number of samples collected in wrong containers/Total number of samples"
Incorrect fill level	a) Percentage of "Number of samples with insufficient sample volume/Total number of samples"
	b) Percentage of "Number of samples with inappropriate sample-anticoagulant volume ratio/Total number of samples with anticoagulant"
Unsuitable samples for transportation and storage problems	a) Percentage of "Number of samples not received/Total number of samples"
	b) Percentage of "Number of samples not properly stored before analysis/Total number of samples"
	c) Percentage of "Number of samples damaged during transportation/Total number of samples"
	d) Percentage of "Number of samples transported at inappropriate temperature/Total number of samples"
	e) Percentage of "Number of samples with excessive transportation time/Total number of samples"
Contaminated samples	Percentage of "Number of contaminated samples rejected /Total number of samples"
Samples hemolyzed	Percentage of "Number of samples with free Hb>0.5 g/L/Total number of samples (clinical chemistry)*" *Clinical chemistry: i.e., all samples which are analyzed on the chemistry analyzer which is used for detection of HIL indices. If laboratories are detecting hemolysis visually, they count all samples with visible hemolysis (clinical chemistry). We suggest that a color chart is provided for this purpose.
Samples clotted	Percentage of "Number of samples clotted/Total number of samples with an anticoagulant"

- *are the procedures in my lab standardized?*
- *are they in accordance with existing guidelines?*
- *level of compliance?*


Island Vis
Thank you!