



MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE



**SANT JOAN
D'ALACANT**
DEPARTAMENT DE SALUT

Dra. María Salinas

Hospital Universitario San Juan de Alicante



**GENERALITAT
VALENCIANA**

Conselleria de Sanitat
Universal i Salut Pública



MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

- Para centrarnos
- Corrección defecto
- Corrección exceso
- Corrección mediante CDSS
- Conclusiones



MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

Para centrarnos Nuestro modelo laboratorio

Actualidad



Troponina
Infarto
miocardio



HbA1c
Diabetes

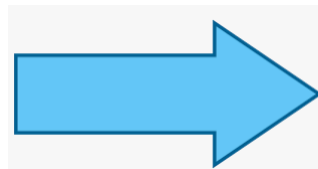


Albúmina
orina
Daño renal
crónico



NT proBNP
Insuficiencia
cardiaca

Prueba Laboratorio

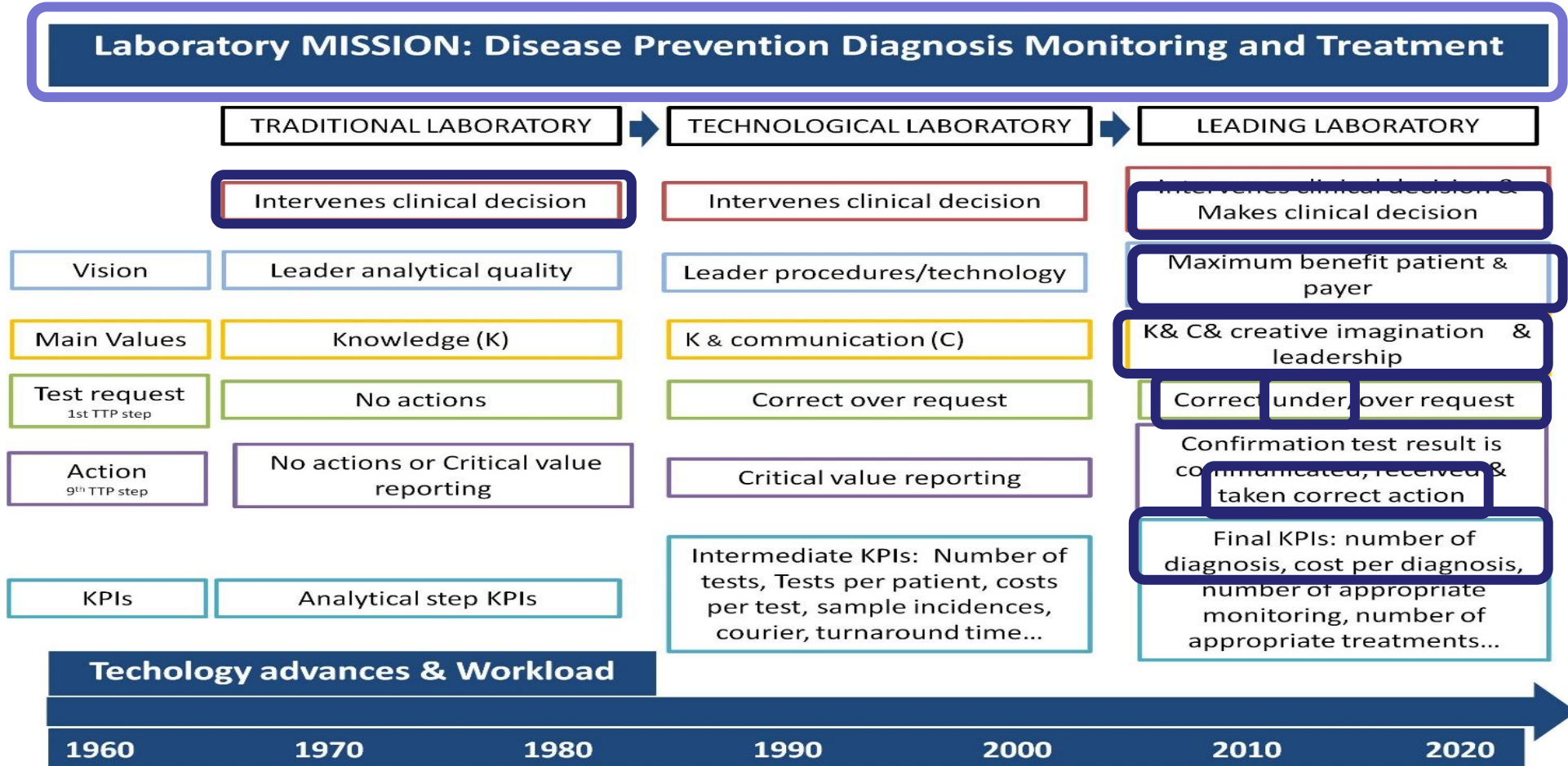


Decisión Clínica

María Salinas*, Maite López-Garrigós, Emilio Flores, Esther Martín and Carlos Leiva-Salinas

Clin Chem Lab Med 2021; 59(10): 1634–1641

The clinical laboratory: a decision maker hub



Corrección *Defecto Solicitud* Prueba Laboratorio

DETECCIÓN
ENFERMEDAD
OCULTA

A MUY BAJO COSTE...lo caro ya está hecho

Actualidad



HOSPITAL CAMAS



395

HABITANTES



230.000



LABORATORIO

260.000
pacientes/año

CARDIOLOGIA

15.000?
pacientes/año

REUMATOLOGIA

7.000?
pacientes/año

CRIBADO OPORTUNISTA

IDENTIFICACION PACIENTES ENFERMEDAD OCULTA

CORRECCIÓN DEFECTO CALCIO

HIPERPARATIROIDISMO PRIMARIO

Laboratory quality report

| Interventions | Jul20 | Aug20 | Sep20 | Accumulated |
|---|-------|-------|-------|-------------|
| Primary Hiperparathyroidism (pHPT) | | | | |
| s-Ca added | 758 | 858 | 647 | 92654 |
| Hypercalcemia(PTH, 25(OH)D and Phosphate added) | 7 | 5 | 14 | 701 |
| pHPT biochemical pattern identified patients | 4 | 4 | 5 | 399 |
| Confirmed* pHPT identified patients | 3 | 5 | 4 | 369 |
| Cost per pHPT patient | | | | 20.2€ |
| Diabetes | | | | |
| HbA1c added in patients >45 | 29 | 25 | 8 | 3522 |
| HbA1c added in patients <45 and altered lipid tests | 11 | 7 | 9 | 435 |
| Diabetes identified patients | 3 | 1 | 2 | 247 |
| Cost per diabetes patient | | | | |
| - In patients >45 years | | | | 14.3€ |
| - In patients <45 years | | | | 5.3€ |
| Vitamin B12 deficiency | | | | |
| s-vitamin B12 added based on MCV value | 31 | 28 | 39 | 1557 |
| s-vitamin B12 added based on PPI treatment | 17 | 14 | 20 | 643 |
| Vitamin B12 deficiency identified patients | 3 | 2 | 3 | 178 |
| Cost per vitamin B12 deficiency patient | | | | |
| - Based on MCV value | | | | 34€ |
| - Based on PPI | | | | 28.3€ |
| Magnesium deficiency | | | | |
| s-Mg added based on hypocalcemia or hypokalemia | 22 | 34 | 22 | 1398 |
| s-Mg added in patients with diabetes, or >65 | 189 | 172 | 196 | 3415 |
| s-Mg added based on PPI treatment | 29 | 25 | 30 | 108 |
| Magnesium deficiency identified patients | 38 | 35 | 41 | 1269 |
| Cost per magnesium deficiency patient | | | | |
| - Based on hypocalcemia or hypokalemia | | | | 0.6€ |
| - Patients with diabetes or >65 | | | | 2€ |
| - Based on PPI treatment | | | | 2.9€ |

Table 2: Outcome indicators.

| Intervention | Outcome indicator | Pre-intervention period (period; result) | Post-intervention period (period; result) |
|------------------------------|-----------------------|--|---|
| Calcium [1] | N parathyroidectomies | 2011–2012; 10 | 2018–2019; 34 |
| HbA1c [2, 3]* | % Patients with HbA1c | 2016; 32.5% | 2019; 36.4% |
| Vitamin B12 [4, 5]* | N intra B12 | | |
| Magnesium [6–8] ^a | % ED r | | |

Final KPIs: number of diagnosis, cost per diagnosis, number of appropriate monitoring, number of appropriate treatments...

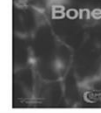
^ap<0.05.



Contents lists available at SciVerse ScienceDirect

Bone

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



Rapid Communication

Serum calcium (S-Ca), the forgotten test: Preliminary results of an appropriateness strategy to detect primary hyperparathyroidism (pHPT)



Maria Salinas ^{a,b,*}, Maite López-Garrigós ^a, Francisco Pomares ^c, Javier Lugo ^a, Alberto Asencio ^d, Luis López-Penabaz ^c, Jose Ramón Domínguez ^c, Carlos Leiva-Salinas ^e

^a Clinical Laboratory Department, Hospital Universitario de San Juan, San Juan de Alicante, Spain

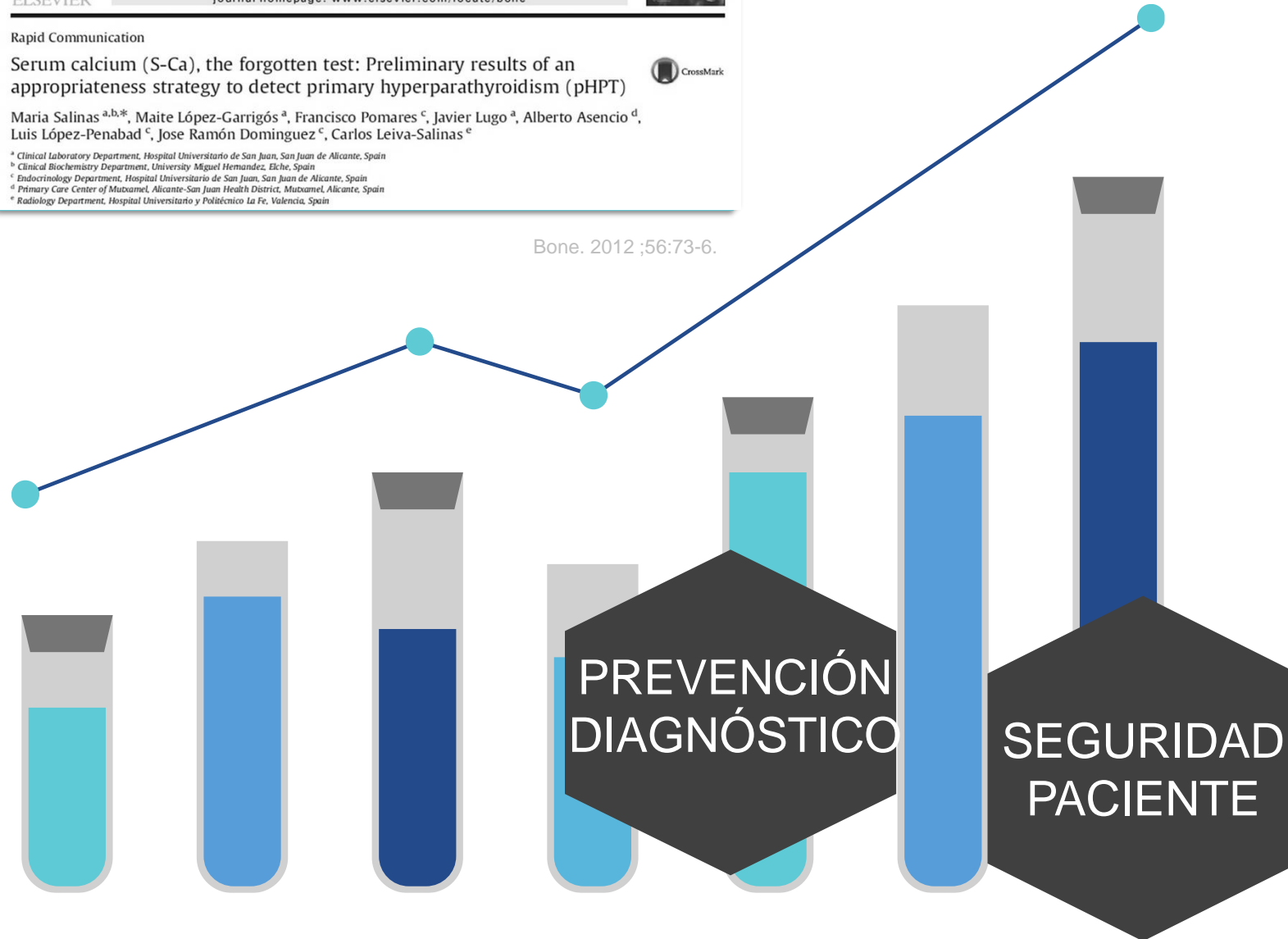
^b Clinical Biochemistry Department, University Miguel Hernández, Elche, Spain

^c Endocrinology Department, Hospital Universitario de San Juan, San Juan de Alicante, Spain

^d Primary Care Center of Mutxamel, Alicante-San Juan Health District, Mutxamel, Alicante, Spain

^e Radiology Department, Hospital Universitario y Politécnico La Fe, Valencia, Spain


Bone. 2012 ;56:73-6.



Corrección *Defecto Solicitud Prueba Laboratorio*



DETECCION ENF
OCULTA



MONITORIZACIÓN ENF
MEJORA ADHERENCIA
GUÍAS CLÍNICAS

DEFECTO SOLICITUD ACORDE A GUÍAS HIPERTENSIÓN Y DIABETES

REAL TIME TEST REQUEST: CPOE

OUTPATIENT

The screenshot shows the iGestlab web application interface. At the top, there is a navigation bar with the logo and menu items like 'Archivo', 'Edición', 'Ver', 'Favoritos', and 'Herramientas'. Below this is a header with the site name '/GestLab' and a breadcrumb trail: 'Análisis clínicos - hospital sant joan d'alacant / consultas externas'. The main area is titled 'Alta de peticiones' and contains a form for creating a request. The form includes fields for 'Petición', 'Extracción', 'Código externo', 'Nº Historia', 'Apellidos', 'Procedencia', 'Nº Sanitarios', 'Nombre', 'Servicio', 'NIF', 'Fecha nac.', 'Médico', 'Diagnóstico', 'Centro extracción', 'Tratamiento', and 'Localización'. There are also checkboxes for 'Mantener datos paciente', 'Mantener datos administrativos', and 'Mantener pruebas'. Below the form is a 'Panel de pruebas' section with tabs for 'Otras pruebas', 'Favoritos', 'Pruebas seleccionadas', 'Comentario', and 'Peticiones recientes del paciente'. The 'Peticiones recientes del paciente' tab is active, showing a list of tests categorized into 'BIOQUÍMICA', 'HEMOGRAMA', 'HEMATOLOGÍA', 'HORMONAS', and 'HEPATITIS, MARC. TUMORALES'. A watermark 'TechSmith' is visible over the interface.

DEFECTO SOLICITUD ACORDE A GUÍAS HIPERTENSIÓN Y DIABETES



ELSEVIER

Contents lists available at ScienceDirect

Clinical Biochemistry

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



Diabetes Ther (2019) 10:995–1003
<https://doi.org/10.1007/s13300-019-0600-z>

ORIGINAL RESEARCH



Short Communication

Laboratory intervention to improve the request of urinary albumin in primary care patients with arterial hypertension and financial implications

Maria Salinas^{a,b,*}, Maite López-Garrigós^a, Emilio Flores^{a,c}, Miguel Ahumada^c, Carlos Leiva-Salinas^d, On behalf of the PRIMLAB working group

Table 2: Outcome indicators.

| Intervention | Outcome indicator | Pre-intervention period (period; result) | Post-intervention period (period; result) |
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| Vitamin B12 [4, 5]* | N intramuscular Vit B12 | 2014–2015; 3,009/100,000 inhabitants | 2019–2020; 4,580/100,000 inhabitants |
| Magnesium [6–8] ^a | % ED readmissions | 2015–2016; 25% | 2019–2020; 13% |

Clin Biochem

Diabetes Ther (2019) 10:995–1003.

^ap<0.05.

MEJORA
ADHERENCIA
GUÍAS CLINICAS

MONITORIZACION

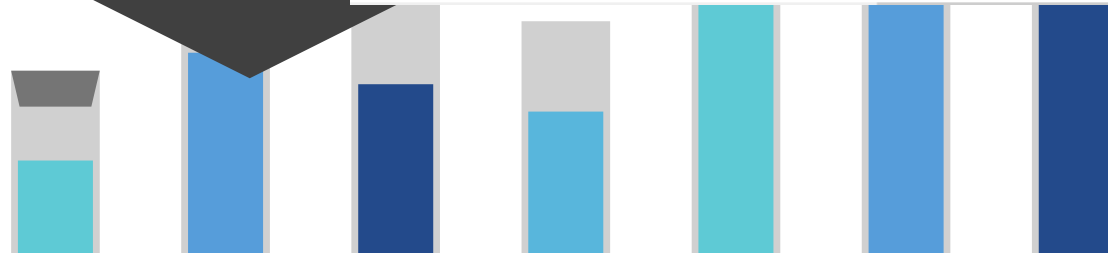
AD
TE



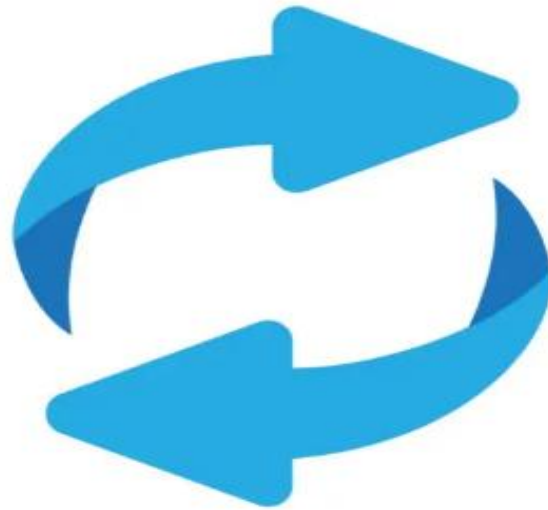
SANT JOAN
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DEPARTAMENT DE SALUT



GENERALITAT
VALENCIANA
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Universitat i Salut Pública



**En paralelo
entorno publico**



BILIRRUBINA “A COSTE CERO”

Diagnostic accuracy of icteric index to detect abnormal total bilirubin values

Maria Salinas,¹ Maite López-Garrigós,¹ Javier Lugo,¹ Mercedes Gutiérrez,¹ Lucia Flors,² Carlos Leiva-Salinas²



J Clin Pathol. 2012 ;65:928-33..

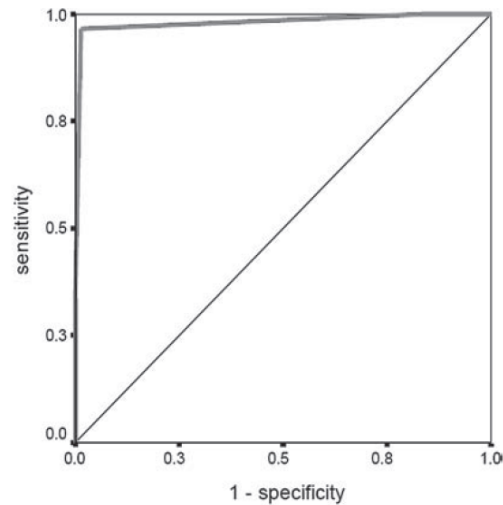


Figure 2 Receiver operator characteristic (ROC) curve for serum icteric index of the whole population. ROC curve analyse to discriminate between patients with normal and abnormal bilirubin values. The area under the curve for the icteric index was 0.981.

Original article

Table 2 Prediction of abnormal total bilirubin using a 34.2 $\mu\text{mol/l}$ (2 mg/dl) icteric index threshold in the whole population and for inpatients, outpatients and primary care patients

| | Whole population | Inpatients | Outpatients | Primary care patients |
|-----------------|------------------------|---------------------------|------------------------|------------------------|
| Sensitivity (%) | 96.48 | 94.96 | 96.31 | 98.46 |
| Specificity (%) | 98.70 | 99.28 | 98.82 | 98.42 |
| PPV (%) | 78.38 | 94.25 | 77.08 | 67.19 |
| NPV (%) | 99.83 | 99.37 | 99.85 | 99.95 |
| LR+ (95% CI) | 74.28 (70.27 to 78.52) | 131.01 (106.96 to 160.47) | 81.49 (74.47 to 89.16) | 62.23 (57.72 to 67.09) |
| LR- (95% CI) | 0.04 (0.03 to 0.04) | 0.05 (0.04 to 0.06) | 0.04 (0.03 to 0.05) | 0.02 (0.01 to 0.02) |

LR-, likelihood ratio negative; LR+, likelihood ratio positive; NPV, negative predictive value; PPV, positive predictive value.

AHORRO Informe Ahorro Estrategias Implantadas Estrategias Gestlab

| Estrategia | 2023 | | | | | | | | | | | | ACUMULADO |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| | ene | feb | mar | abr | may | jun | jul | ago | sep | oct | nov | dic | |
| X-AST | 528,11 € | 536,25 € | 625,90 € | 418,33 € | 577,17 € | 608,41 € | 480,59 € | 404,14 € | 496,54 € | 538,67 € | 566,72 € | 577,17 € | 5.201,55 € |
| X-BILIRRUBINA TOTAL | 2.035,66 € | 1.984,18 € | 2.189,66 € | 1.671,34 € | 2.146,76 € | 1.973,18 € | 1.666,28 € | 1.571,46 € | 1.879,46 € | 2.046,22 € | 2.166,34 € | 2.325,46 € | 23.166,00 € |

ALBUMINA ORINA “CASI A COSTE CERO”

DE GRUYTER

Clin Chem Lab Med 2018; aop

Maria Salinas*, Maite López-Garrigós, Emilio Flores, Javier Lugo and Carlos Leiva-Salinas, on behalf of the PRIMary Care-LABoratory (PRIMLAB) working group

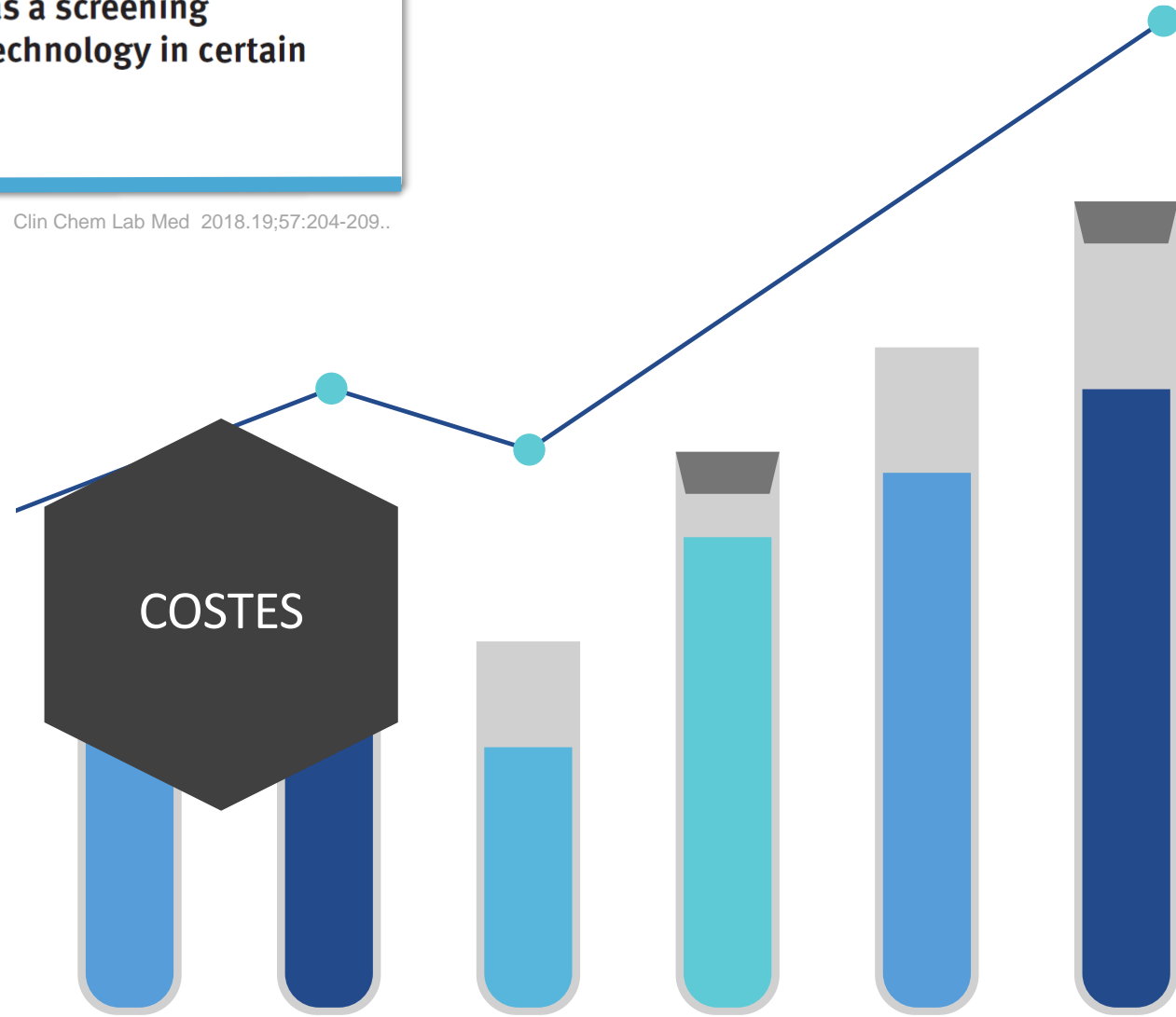
Urinary albumin strip assay as a screening test to replace quantitative technology in certain conditions

Clin Chem Lab Med 2018.19;57:204-209..

Table 2: Diagnostic indicators and potential saving, considering negative values when the strip ACR value is normal (column I), and when the albumin value = 10 mg/L, with creatinine values above 0.88 mmol/L, 4.42 mmol/L and 8.84 mmol/L, respectively (columns II, III and IV).

| Column | ACR=normal I | Creatinine >0.88 mmol/L Albumin = 10 mg/L II | Creatinine >4.42 mmol/L Albumin = 10 mg/L III | Creatinine >8.84 mmol/L Albumin = 10 mg/L IV |
|----------------------|-----------------|--|---|--|
| Negatives | 7350 | 7099 | 3506 | 693 |
| False negatives | 293 (4.0%) | 280 (3.9%) | 35 (1.0%) | 1 (0.1%) |
| Potential savings, € | 9262.58 | 8933.77 | 4226.94 | 541.91 |
| P99 mg/g ACR | 55.7 | 56.1 | 30.0 | 15.9 |
| Sensitivity, % | 77 | 77 | 97 | 100 |
| Specificity, % | 90 | 92 | 44 | 9 |
| PPV, % | 55 | 61 | 22 | 15 |
| NPV, % | 96 | 96 | 99 | 100 |
| LR+ (95% CI) | 7.70 | 1.59 | 1.73 | 1.1 |
| LR- (95% CI) | 0.26 | 0.21 | 0.07 | 0 |

PPV, positive predictive value; NPV, negative predictive value; LR+, positive likelihood ratio; LR-, negative likelihood ratio; P99, 99th percentile.



COSTES

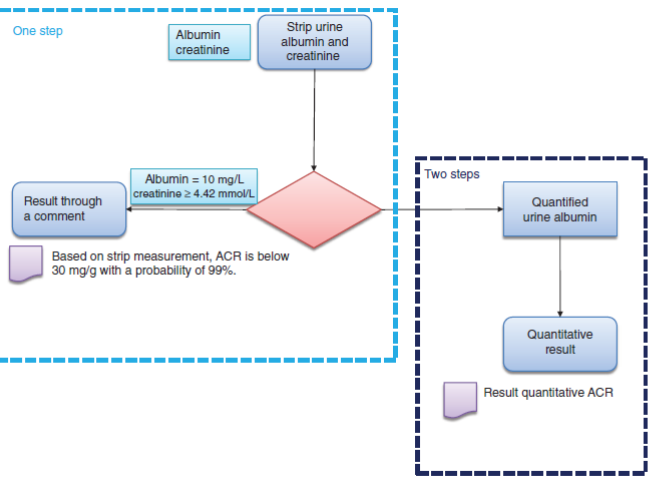
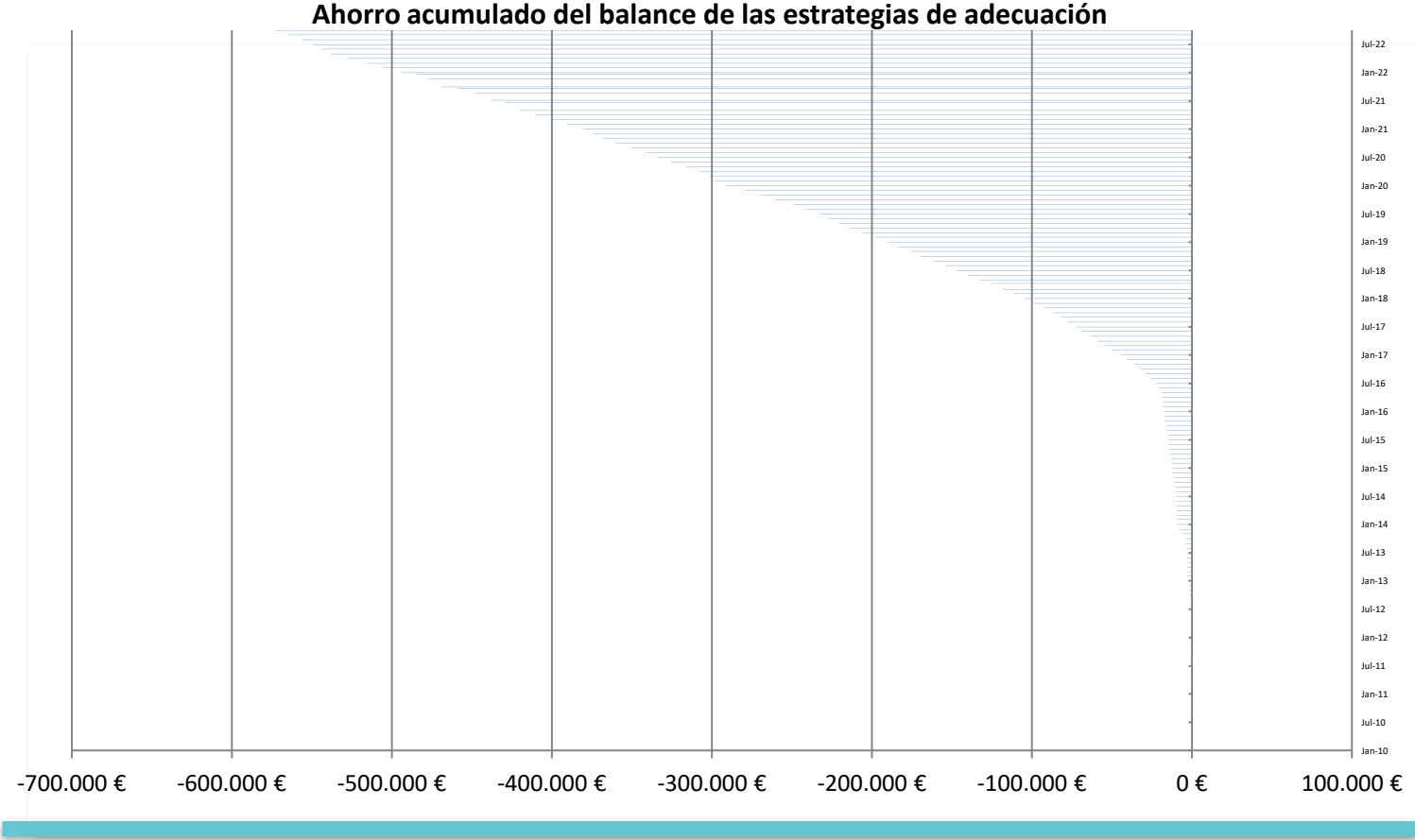


Figure 1: Flow chart to avoid urine albumin quantification through strip analysis.

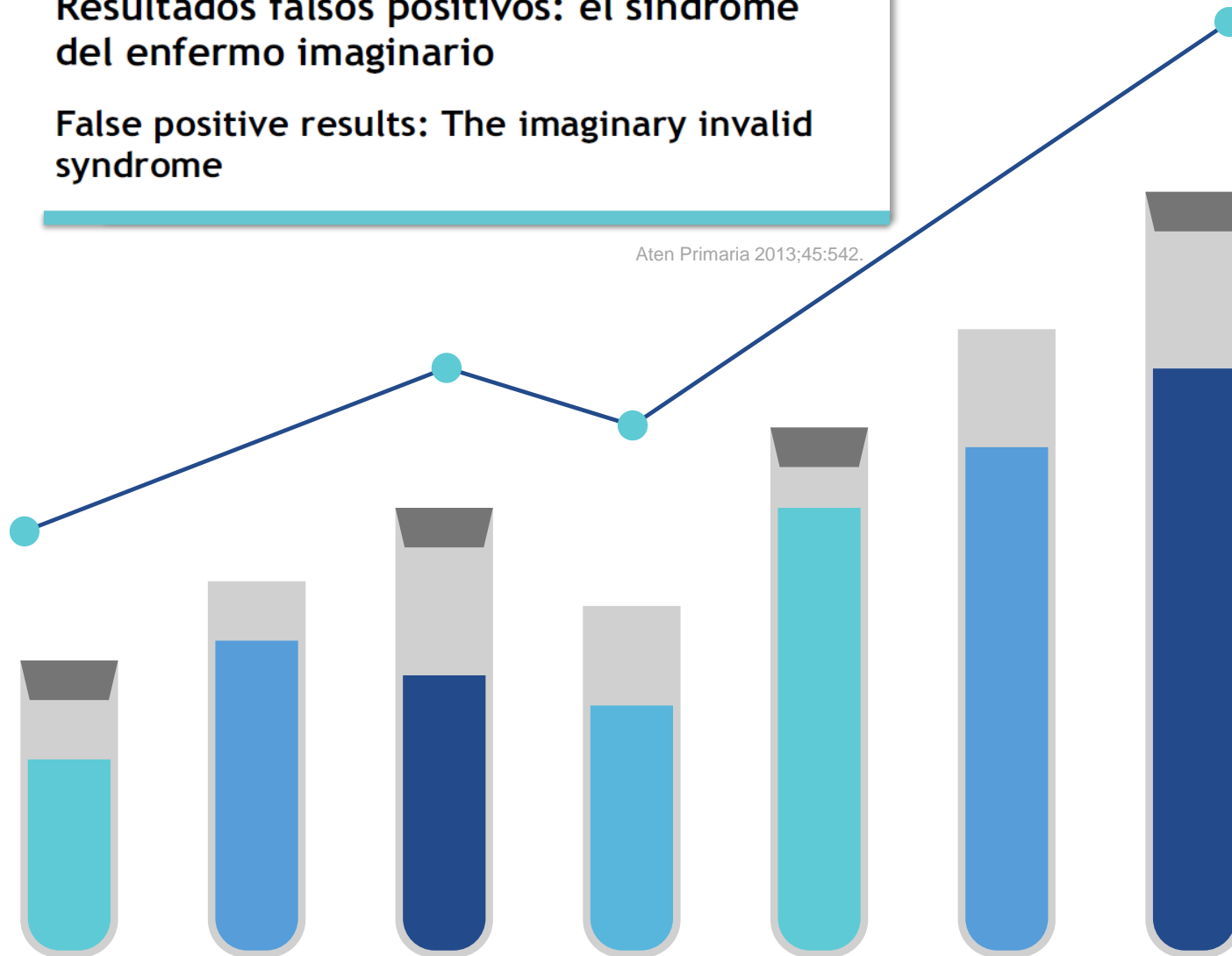
BALANCE ECONÓMICO CORRECCION DEFECTO/EXCESO DEMANDA



Resultados falsos positivos: el síndrome del enfermo imaginario

False positive results: The imaginary invalid syndrome

Aten Primaria 2013;45:542.





Contents lists available at ScienceDirect

Clinical Biochemistry

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



Short Communication

Strategy to improve the request of uric acid in primary care: Preliminary results and evaluation through process and outcome appropriateness indicators



Maria Salinas ^{a,b,*}, Ma

Mauricio Miguez ^d, Javier Lugo ^a

TEST NIVEL RIESGO 3



...mel, Alicante, Spain
...de Alicante, Spain
...Alicante, Spain



SEGURIDAD PACIENTE

1.- SIL y su base datos

Managing Inappropriate Requests of Laboratory Tests: From Detection to Monitoring

Maria Salinas, PhD; Maite López-Garrigós, PhD; Emilio Flores, PhD; Maria Leiva-Salinas, MD, PhD; Alberto Asencio, MD; Javier Lugo, MD; and Carlos Leiva-Salinas, MD, PhD

Am J Manag Care. 2016;22:e311-e316.

Table A. Ways to Identify and Correct Potential Inappropriateness Uses of Laboratory Tests

| |
|---|
| <p>Evaluate:</p> <ul style="list-style-type: none"> → Studies on test-utilization differences among geographical areas → Retrospective studies of test utilization in the LIS patient database <ul style="list-style-type: none"> → Comparison to guidelines or disease prevalence |
| <p>Select test and target populations for strategy implementation:</p> <ul style="list-style-type: none"> → Based on scientific evidence and on consensus with requesting physicians |
| <p>Generate the idea:</p> <p>If possible based on automatic processes, on the LIS</p> |
| <p>Pre-design the strategy:</p> <ul style="list-style-type: none"> → In consensus with requesting physicians, after LIS retrospective simulation |
| <p>Create final design:</p> <ul style="list-style-type: none"> → Write the procedure: objectives, strategic initiative, indicators, and goals. |
| <p>Establish strategy</p> |
| <p>Monitor through process indicators</p> |
| <p>Evaluate through outcome indicators</p> |
| <p>Make final decision: continue or stop strategy</p> |





MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

Corrección defecto

**Tenemos
muchísimas
corrección
defecto**

**DETECCION ENF
OCULTA**

Original papers

Automatic laboratory-based strategy to improve the diagnosis of type 2 diabetes in primary care

Marín-Aragón^{1,2}, Emilio Flores^{1,3}, María Leiva-Salinas², Javier Lugo¹, Francisco J Pomares⁴, Alberto Asencio⁵, Salinas⁵

the Appropriate Utilization of Laboratory Tests

1. Hospital Universitario de San Juan, San Juan de Alicante, Spain
 2. Unidad de Patología Molecular, Universidad Miguel Hernández, Elche, Spain
 3. Unidad de Patología Molecular, Universidad Miguel Hernández, Elche, Spain
 4. Hospital Universitario de San Juan, San Juan de Alicante, Spain
 5. Department of Laboratory Medicine, University of Missouri, Columbia, MO, USA

marin@guva.es

Biochem Med (Zagreb). 2016;26:121-8.



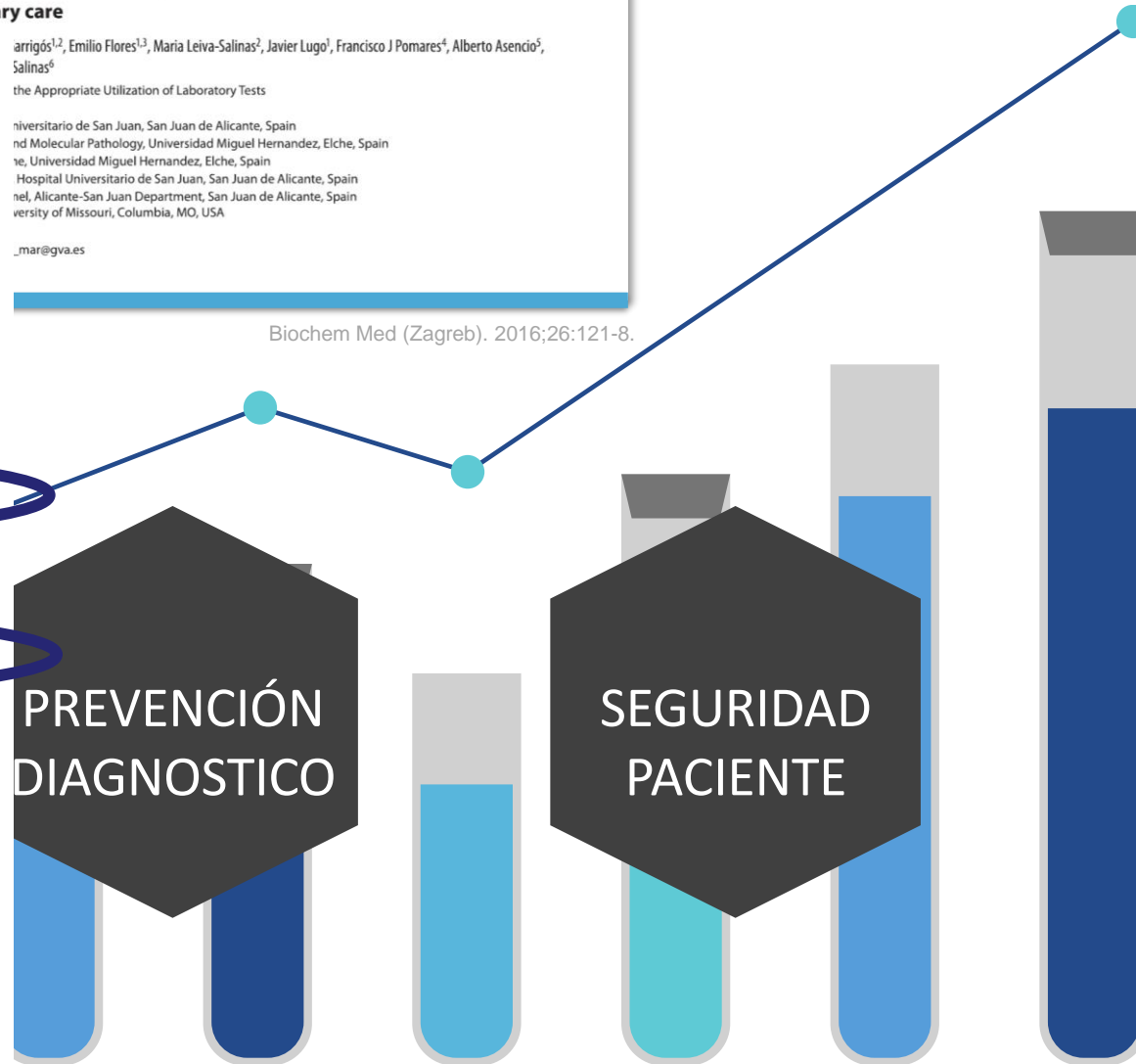
Clinical Laboratory

Laboratory quality report

| Interventions | Jul20 | Aug20 | Sep20 | Accumulated |
|---|-------|-------|-------|-------------|
| Primary Hiperparathyroidism (pHPT) | | | | |
| s-Ca added | 758 | 858 | 647 | 92654 |
| Hypercalcemia(PTH, 25(OH)D and Phosphate added) | 7 | 5 | 14 | 701 |
| pHPT biochemical pattern identified patients | 4 | 4 | 5 | 399 |
| Confirmed* pHPT identified patients | 3 | 5 | 4 | 369 |
| Cost per pHPT patient | | | | 30.2€ |
| Diabetes | | | | |
| HbA1c added in patients >45 years | 20 | 25 | 18 | 3522 |
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| - In patients >45 years | | | | 14.3€ |
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| Cost per vitamin B12 deficiency patient | | | | |
| - Based on MCV value | | | | 34€ |
| - Based on PPI | | | | 28.3€ |
| Magnesium deficiency | | | | |
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| s-Mg added in patients with diabetes, or >65 | 189 | 172 | 196 | 3415 |
| s-Mg added based on PPI treatment | 29 | 25 | 30 | 108 |
| Magnesium deficiency identified patients | 38 | 35 | 41 | 1269 |
| Cost per magnesium deficiency patient | | | | |
| - Based on hypocalcemia or hypokalemia | | | | 0.6€ |
| - Patients with diabetes or >65 | | | | 2€ |
| - Based on PPI treatment | | | | 2.9€ |

PREVENCIÓN
DIAGNOSTICO

SEGURIDAD
PACIENTE



Maria Salinas*, Emilio Flores, Maite López-Garrigós, Maria Leiva-Salinas, Alberto Asencio, Javier Lugo and Carlos Leiva-Salinas



Clinical Laboratory

Assisted interventions in the clinical process

Table 2: Outcome indicators.

Laboratory quality report

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| Cost per diabetes patient | | | | 14.3€ |
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| - In patients <45 years | | | | 7.1€ |
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| s-vitamin B12 added based on PPI treatment | 17 | 14 | 20 | 643 |
| Vitamin B12 deficiency identified patients | 3 | 2 | 3 | 178 |
| Cost per vitamin B12 deficiency patient | | | | 34€ |
| - Based on MCV value | | | | 20.2€ |
| - Based on PPI | | | | 13.8€ |
| Magnesium deficiency | | | | |
| s-Mg added based on hypocalcemia or hypokalemia | 22 | 34 | 22 | 1398 |
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| - Based on hypocalcemia or hypokalemia | | | | 2€ |
| - Patients with diabetes or >65 | | | | 2€ |
| - Based on PPI treatment | | | | 2.9€ |

| Intervention | Outcome indicator | Pre-intervention period (period; result) | Post-intervention period (period; result) |
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| Calcium [1] | N parathyroidectomies | 2011–2012; 10 | 2018–2019; 34 |
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| Magnesium [6–8] ^a | % ED readmissions | 2015–2016; 25% | 2019–2020; 13% |

^ap<0.05.



Automatic laboratory interventions to unmask and treat hypomagnesemia in the Emergency Department



Clinical Laboratory

Laboratory quality report

a-Salinas^d

20;75:48-52.

Clin Chem Lab Med. 2020;58:e221-e223.

Potential serum magnesium under request in primary care. Laboratory interventions to identify patients with hypomagnesemia

Table 2: Outcome indicators.

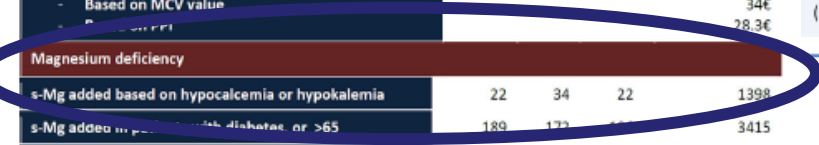
| Intervention | Outcome indicator | Pre-intervention period (period; result) | Post-intervention period (period; result) |
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| Magnesium [6–8] | % ED readmissions | 2015–2016; 25% | 2019–2020; 12% |

^ap<0.05.

231
Ca <7.5 mg/dL

23 (53.2%)
magnesemia

5 Moderate
(36.6%)



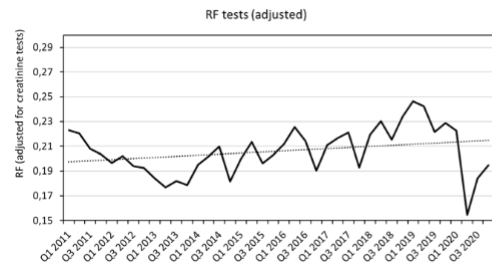


Figure 1. Rheumatoid factor tests ordered by general practitioners from 2011 to 2020 per quarter. Data are shown as

Double positivity for rheumatoid factor and anti-CCP autoantibodies: improving referral from primary care of patients suspected of having rheumatoid arthritis

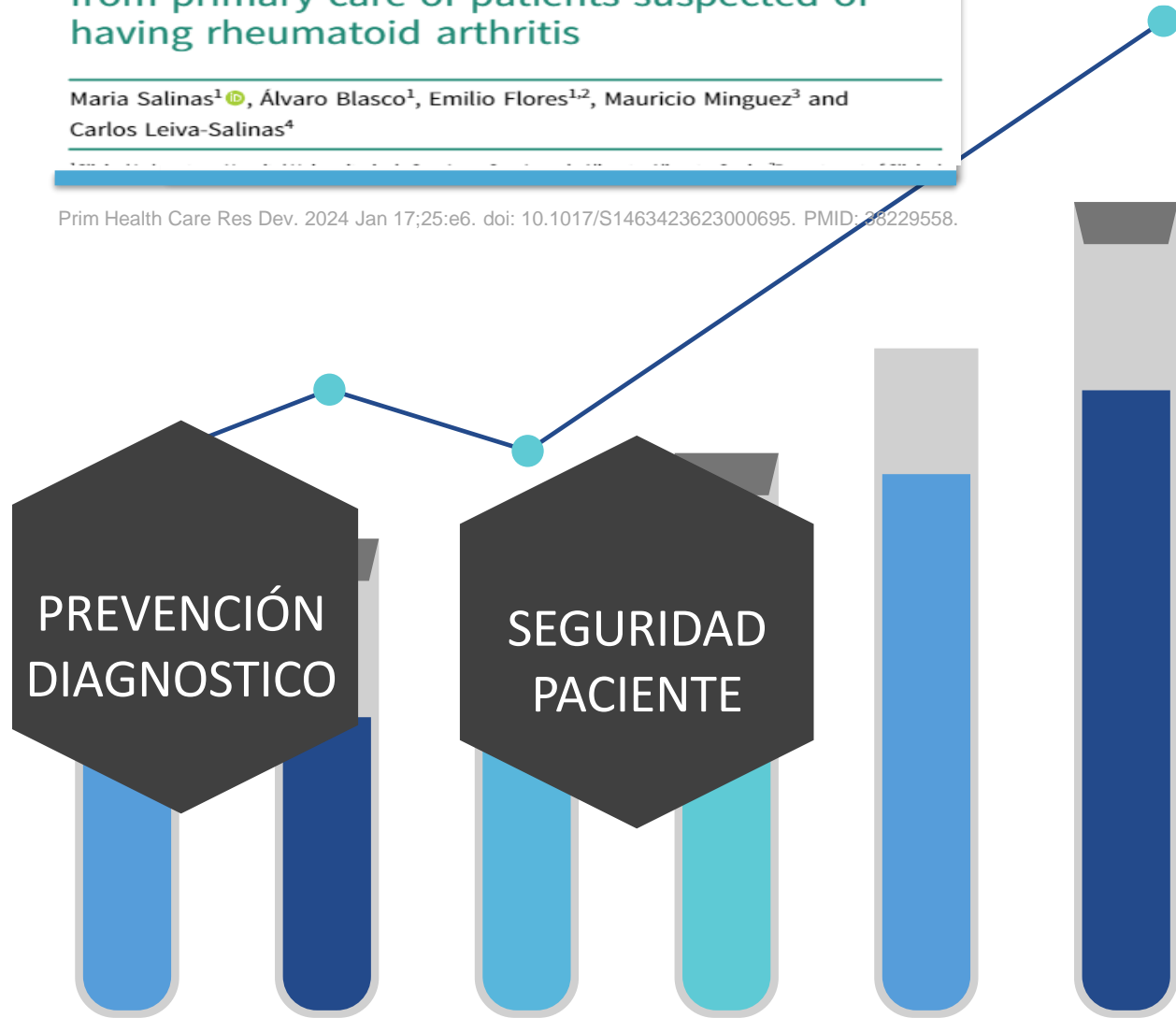
Maria Salinas¹, Álvaro Blasco¹, Emilio Flores^{1,2}, Mauricio Minguez³ and Carlos Leiva-Salinas⁴

Prim Health Care Res Dev. 2024 Jan 17;25:e6. doi: 10.1017/S1463423623000695. PMID: 38229558.

Table 1. Comparison of the results from both diagnostic approaches

| | Retrospective study (01/2017 to 03/2019) | Prospective study (04/2019 to 01/ 2021) |
|--|---|--|
| Initial RF request by PCPs | 34 308 | 17 938 |
| Tests saved | 0 | 2813 |
| Final RF determinations (% of initial requests) | 34 308 (100%) | 15 125 (84%) |
| Positive RF sample vs. total determinations (n, %) | 361 (1.05%) | 145 (0.095%) |
| Anti-CCP IgG tests added | 0 | 145 |
| Patients referred to rheumatology | 120 | 32 |
| New diagnosis of RA | 30 | 14 |
| Delayed diagnosis of RA (% total RA patients) | 11 (27%) | 4 (20%) |
| Unnecessary referrals | 22% | 8.2% |
| Diagnosed patients per RF test | 0.11% | 0.13% |
| Total tests (RF + anti-CCP balance) | | -2668 |

PCP = primary care physician; RF = rheumatoid factor; RA = rheumatoid arthritis.





MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

Corrección exceso

**Tenemos
muchísimas**

**CORRECCIÓN EXCESO
DEMANDA**

Maria Salinas*, Maite López-Garrigós, Emilio Flores, Alvaro Blasco and Carlos Leiva-Salinas on behalf of the PRIMLAB working group

Successful implementations of automated minimum re-test intervals to overcome Ferritin over-requesting in a Spanish hospital laboratory

Clin Chem Lab Med 2020. 25;58:e287-e289.

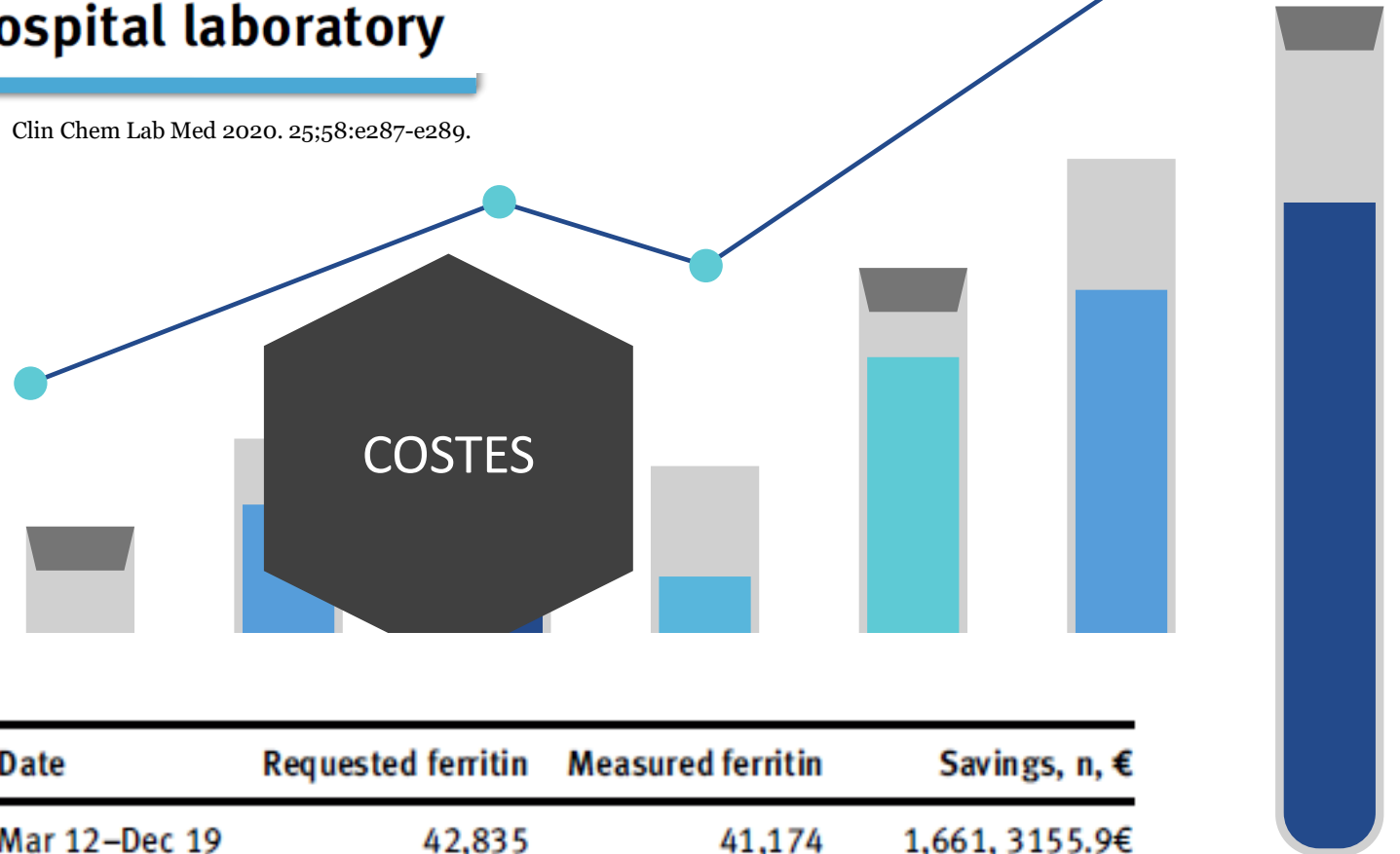
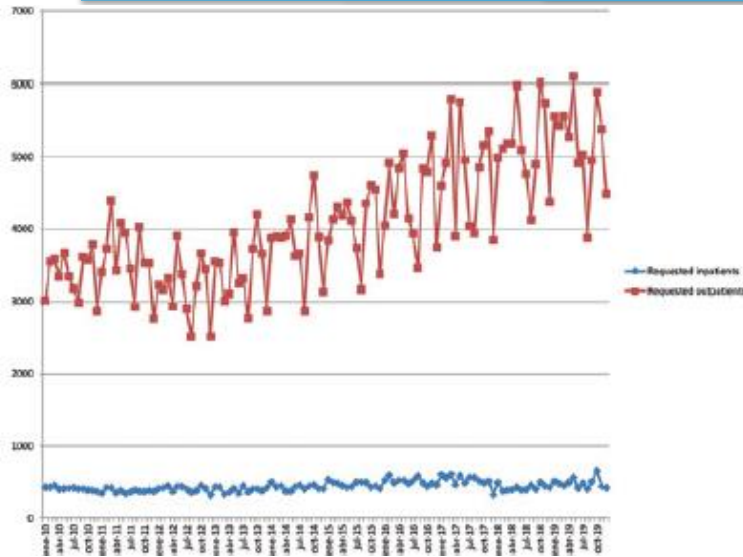


Table 1: Summary of interventions and outcomes.

| Intervention | Date | Requested ferritin | Measured ferritin | Savings, n, € |
|--|---------------|--------------------|-------------------|-----------------|
| The LIS would remove s- ferritin, if previously requested and completed in the past 3 days in inpatients | Mar 12–Dec 19 | 42,835 | 41,174 | 1,661, 3155.9€ |
| The LIS would remove s-ferritin when ordered in a period | Nov 17–Dec 19 | 133,191 | 115,584 | 17,607 33453.3€ |

Original papers

Education and communication is the key for the successful management of vitamin D test requesting

María Salinas^{*1,2}, Maite López-Garrigós^{1,2}, Emilio Flores^{1,3}, María Leiva-Salinas², Miguel Ahumada³, Carlos Leiva-Salinas⁴

¹Clinical Laboratory, Hospital Universitario de San Juan, San Juan de Alicante, Spain

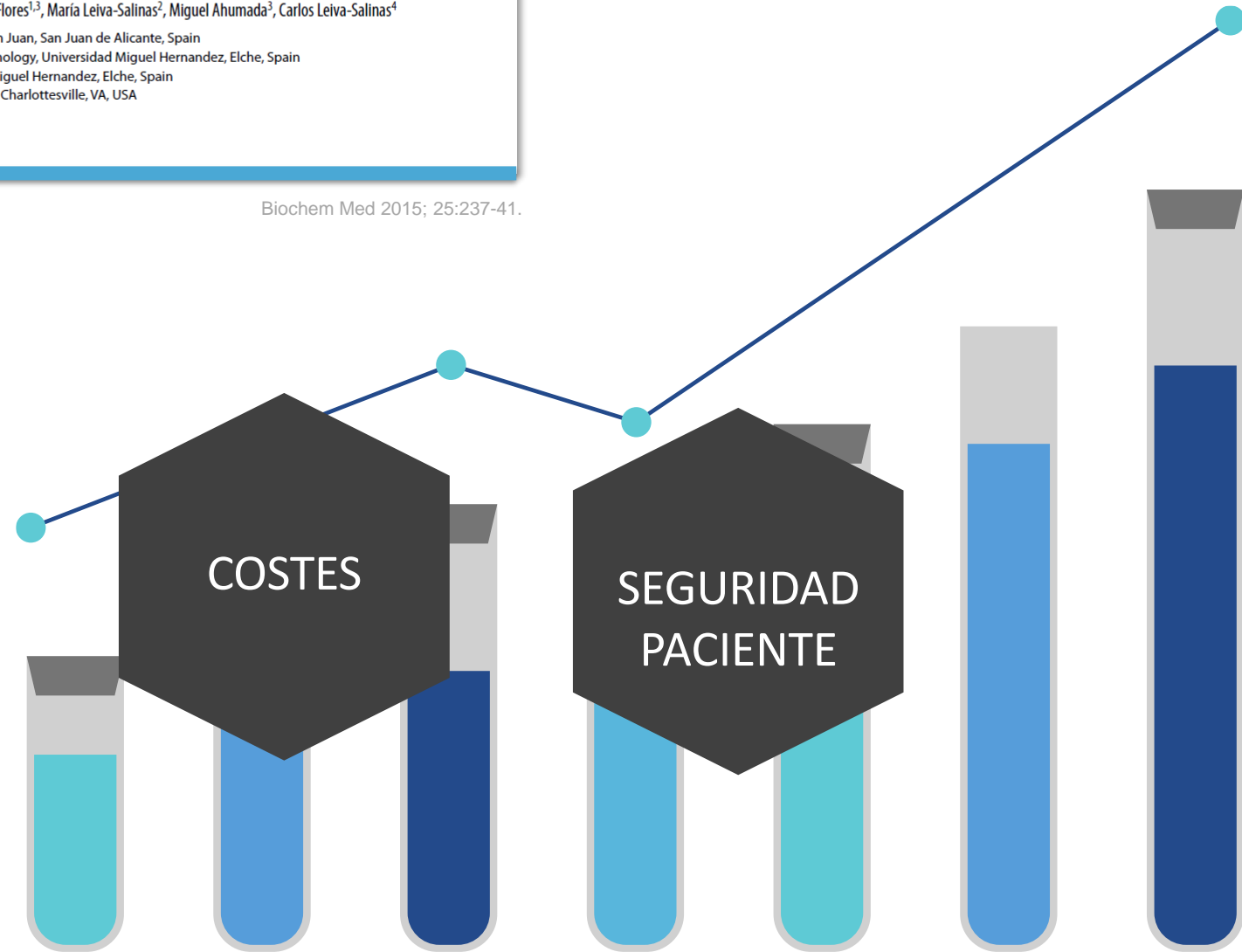
²Department of Biochemistry and Molecular Pathology, Universidad Miguel Hernandez, Elche, Spain

³Department of Clinical Medicine, Universidad Miguel Hernandez, Elche, Spain

⁴Department of Radiology, University of Virginia, Charlottesville, VA, USA

*Corresponding author: salinas_mar@gva.es

Biochem Med 2015; 25:237-41.



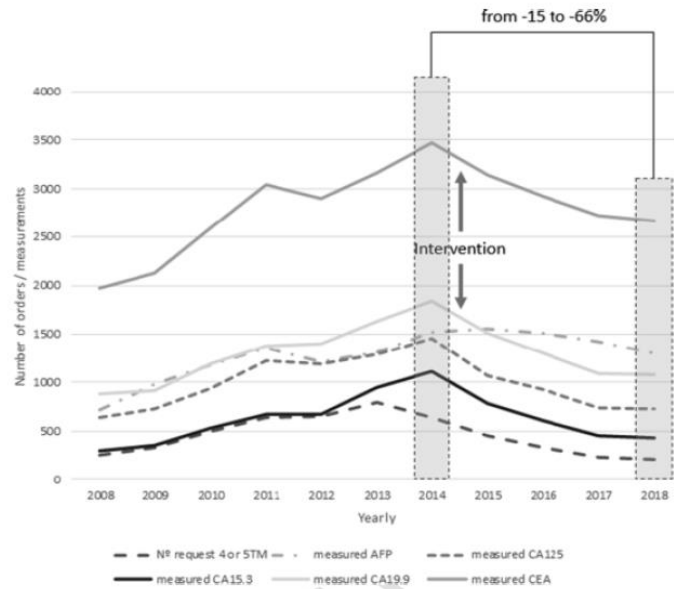
Inappropriate use of laboratory tests: How availability triggers demand – Examples across Europe

Cornelia Mrazek^a, Ana-Maria Simundic^{b,c}, Maria Salinas^d, Alexander von Meyer^e, Michael Cornes^f, Josep Miquel Bauçà^g, Mads Nybo^h, Giuseppe Lippiⁱ, Elisabeth Haschke-Becher^a, Martin H. Keppel^a, Hannes Oberkofler^a, Thomas K. Felder^a, Janne Cadamuro^{a,*}

- ^a Department of Laboratory Medicine, Paracelsus Medical University Salzburg, Salzburg, Austria
- ^b Department of Medical Laboratory Diagnostics, University Hospital Sveti Duh, Zagreb, Croatia
- ^c Faculty of Pharmacy and Biochemistry, University of Zagreb, Croatia
- ^d Clinical Laboratory, Hospital Universitario de San Juan, San Juan de Alicante, Alicante, Spain
- ^e Institute of Laboratory Medicine, Kliniken Nordoberpfalz AG and Klinikum St. Marien, Weiden and Amberg, Germany
- ^f Biochemistry Department, Worcester Acute Hospitals NHS Trust, Worcester, UK
- ^g Department of Laboratory Medicine, Hospital Universitari Son Espases, Palma, Spain
- ^h Dept. of Clinical Biochemistry and Pharmacology, Odense University Hospital, Odense, Denmark
- ⁱ Section of Clinical Biochemistry, University Hospital of Verona, Verona, Italy

Clin Chim Acta. 2020;505:100-7.

C. Mrazek et al.



COSTES

SEGURIDAD PACIENTE

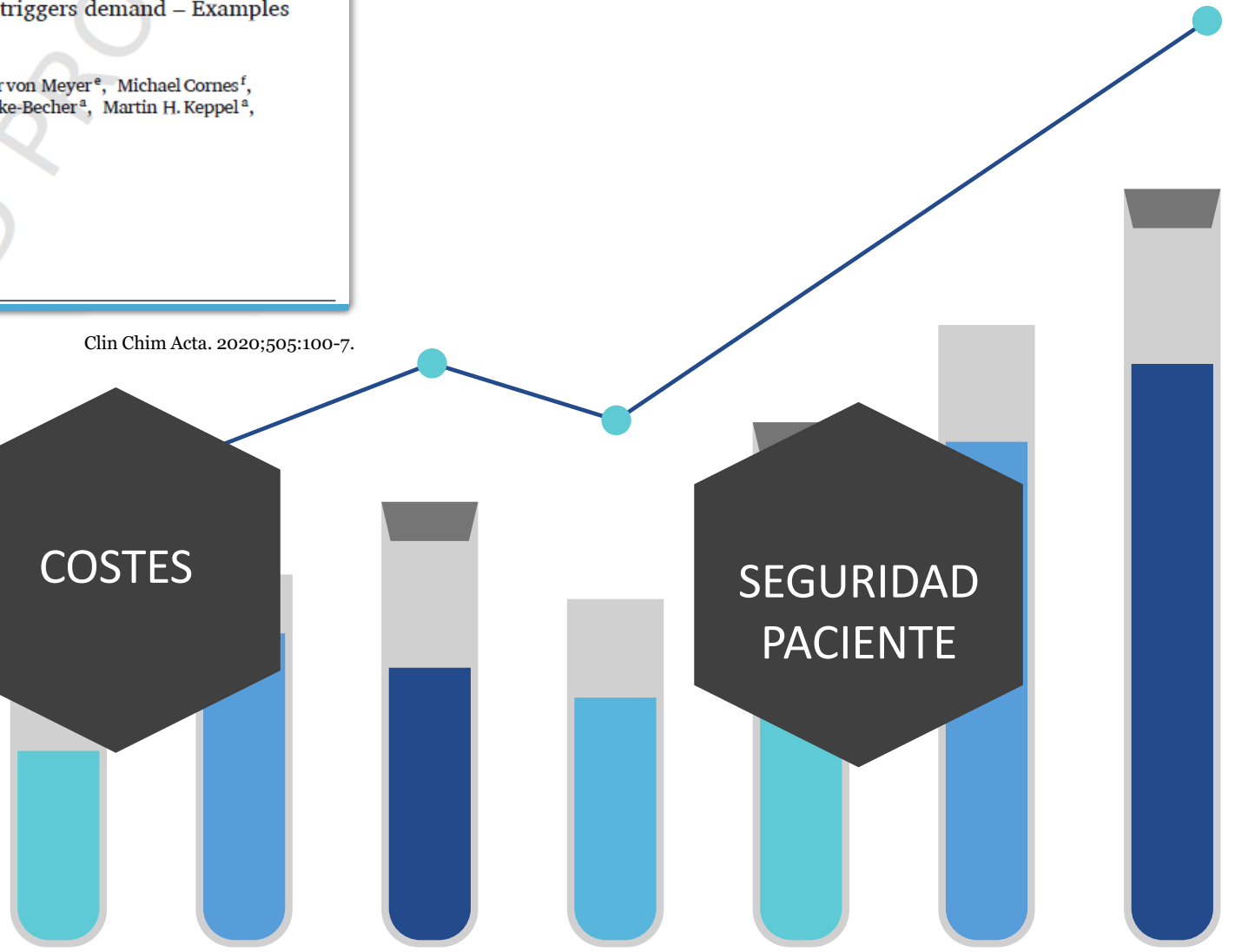


Fig. 2. Spain (Case #2): Effect of gatekeeping strategy in tumor biomarker diagnostics. Effect of a collaborate gate keeping strategy in tumor biomarker diagnostics. TM – tumor biomarker.

Dealing with redundant gamma glutamyl transpeptidase in primary care, when requested along with alkaline phosphatase

Maria Salinas ^{a, *}, Emilio Flores ^{a, b}, Maite López-Garrigós ^{a, c, d}, Rosa Carbonell ^a, Carlos Leiva-Salinas ^e

^a Clinical Laboratory, Hospital Universitario de San Juan, San Juan de Alicante, Spain

^b Department of Clinical Medicine, Universidad Miguel Hernandez, Elche, Spain

^c Department of Biochemistry and Molecular Pathology, Universidad Miguel Hernandez, Elche, Spain

^d CIBER en Epidemiología y Salud Pública (CIBERESP), Madrid, Spain

^e Department of Radiology, University of Missouri, Columbia, MO, United States

. Clin Biochem. 2021;97:74-77.

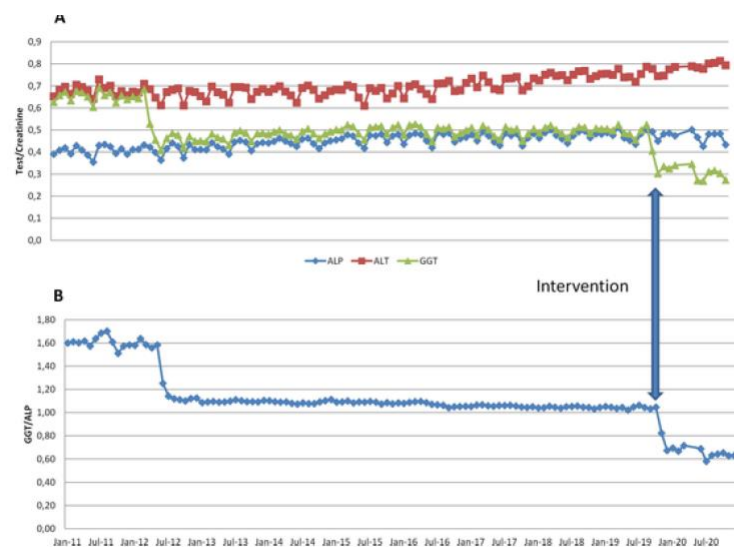
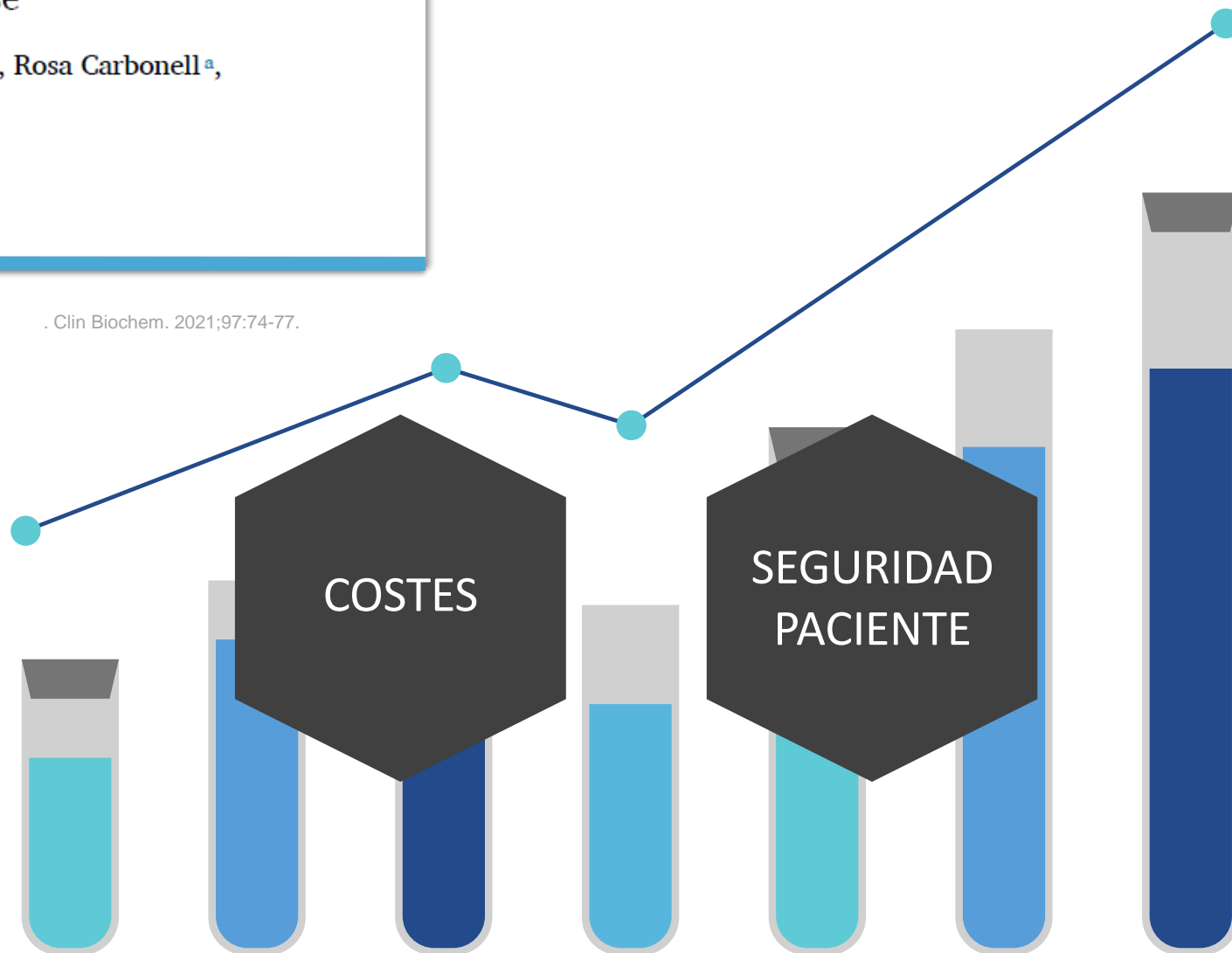


Fig. 1. Monthly trend along the 10 years of test/creatinine ratio (A) and monthly ratio GGT/ALP (B). Fig. 1-A shows the ALT, ALP and GGT ratios referred to creatinine. Fig. 1-B shows the GGT / ALP ratio. Arrow shows the month/year that intervention was established.





MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

Corrección mediante CDSS e IA



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Computational and Structural Biotechnology Journal

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

Clinical Decision Support systems: A step forward in establishing the clinical laboratory as a decision maker hubA CDS system protocol implementation in the clinical laboratory.

Emilio Flores^{a,b,*}, José María Salinas^c, Álvaro Blasco^a, Maite López-Garrigós^a, Ruth Torreblanca^a, Rosa Carbonell^a, Laura Martínez-Racaj^{a,d}, María Salinas^a

Table 1

Examples of Key Performance Indicators (KPIs) at the three laboratory intervention levels: demand management (DM), internal processes, and result management (RM). Outcomes and study periods from different interventions are displayed, as well as CDS intervention details of interest. *Results published in: [21].* *Calculated reagent costs.

| Examples of Key Performance Indicators (KPIs) | | | | |
|---|--|--|--------------------------|---|
| Intervention level | KPIs | Outcomes | Study period | Intervention details |
| Demand management (DM) | Number of new hypercalcemia of malignancy cases in the ED | 186 cases | January 2022 - June 2023 | CDS registers serum total calcium in every ED patient request aged 40–90 with a known malignant disease |
| | Number of removed thyroid test over requests | 3 670 tests (Savings of 5 395 Euros) * * | | CDS removes a thyroid test when requested in the previous 3-months and unknown thyroid disease |
| Internal processes | Post-analytical turnaround time (TAT) | 27.5 min vs. 2.5 min | June 2021 vs. June 2023 | Time spent from test result retrieval in the laboratory to its availability in the ED |
| | Percentage of auto-verification | 75% vs. 91% | | Calculation of the percentage of tests automatically verified with respect to the total number of tests performed |
| Result management (RM) | Number of primary care (PC) patients classified with low risk of heart failure (HF) after NT-proBNP interpretation | 370 patients | June 2022 - June 2023 | CDS registers an interpretative comment (according to clinical guidelines recommendations) regarding patient HF risk in patients with unknown HF. |
| | Number of cases with pancreatitis prognosis in the ED | 180 patients | | CDS calculates the Ranson and SIRS scores for the LIS to report a prognostic comment on any ED patient with high pancreatic enzymes values. |



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Computational and Structural Biotechnology Journal

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

Research article

A step forward in the diagnosis of urinary tract infections: from machine learning to clinical practice

Emilio Flores^{a,b,*}, Laura Martínez-Racaj^a, Álvaro Blasco^a, Elena Diaz^c, Patricia Esteban^a, Maite López-Garrigós^a, María Salinas^a

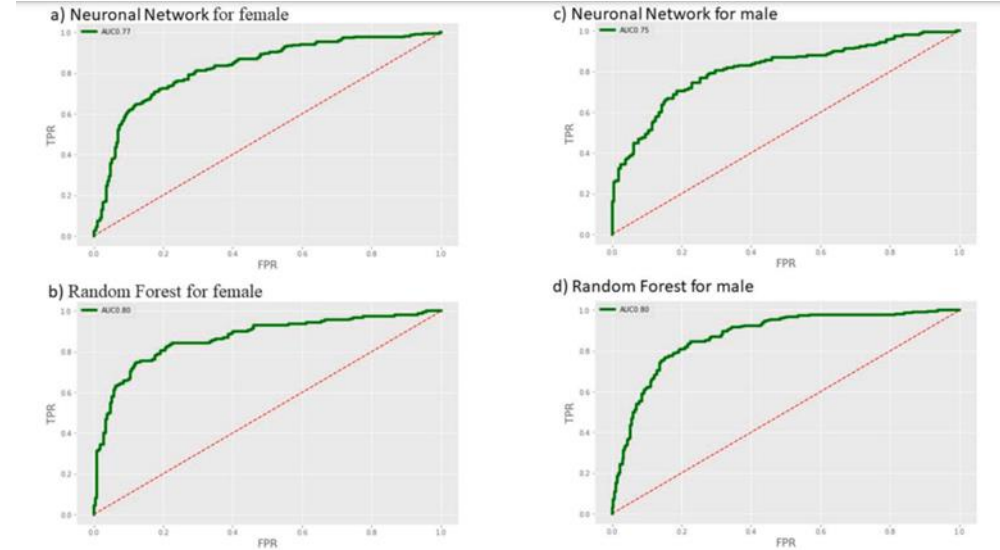


Fig. 3. – Work-flow diagram: retrospective analysis from Emergency Department (ED). Study period: 33 months [01/04/2018 – 31/12/2021]. retrospective analysis from HUSJA Emergency Department (ED). Study Time Period: 33 months [01/04/2018 – 31/12/2021]. We excluded patients due to the lack of gold standard and due to contaminated culture. *Positive urine culture defined by: >10⁴ colony forming units/ML. UTI: Urinary tract infection ROC indices for the NN and RF models by gender. TPR: True positive rate; FPR: False positive rate.

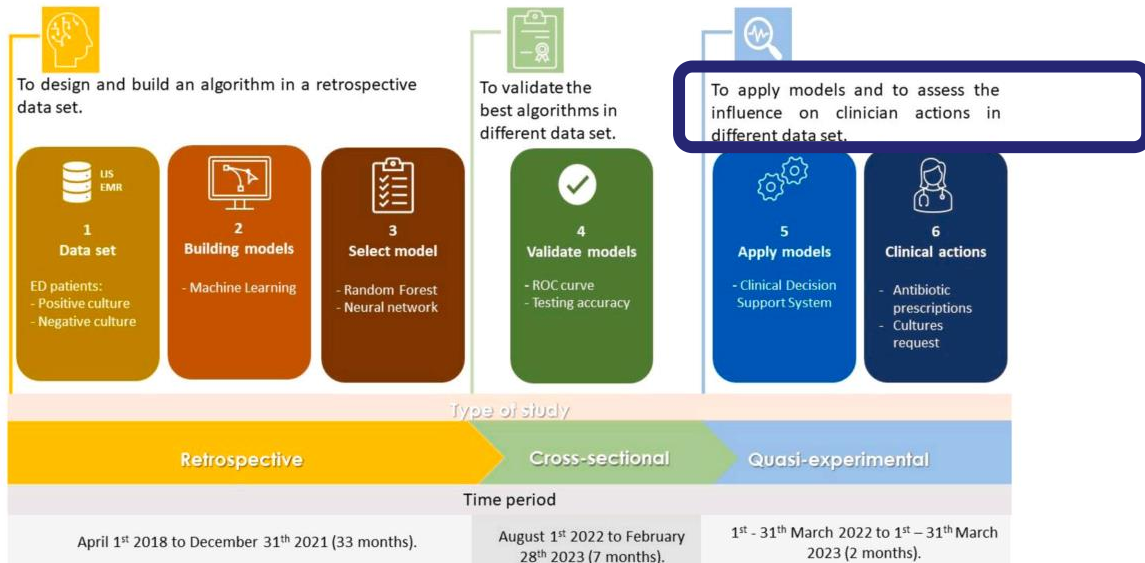


Fig. 1. – Timeline diagram of the three types of studies conducted and their respective aims. Shows the consecutive steps of the study and a timeline diagram, summarizing study periods and the aims of the three mentioned investigations.

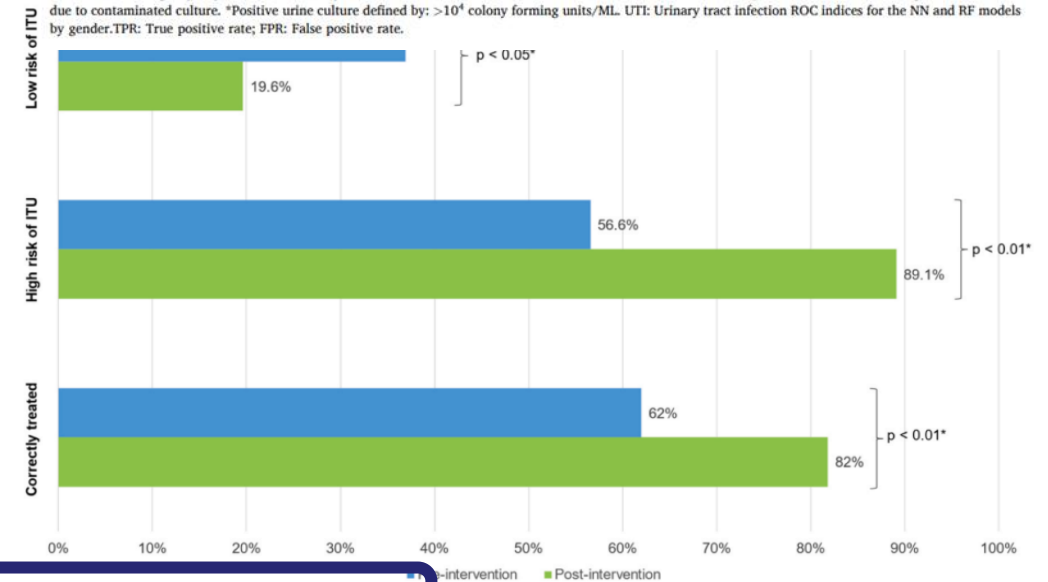


Fig. 2. – Changes in antibiotic prescription: pre-intervention vs. post-intervention. Physicians' behaviour regarding antibiotic prescriptions and cases that were correctly treated from the Emergency Department before (pre-intervention) and after (post-intervention) implementation of the new diagnostic process. * A two-sided $p \leq 0.05$ rule was used as the criterion for rejecting the null hypothesis of no difference. UTI: Urinary tract infections.



MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

AGENDA

Conclusiones

Evolución Medicina Laboratorio

Actualidad

Laboratorio 64 % decisiones médicas

Kruse-Jarres JD. Lab Med 1994;18:213-6

**70 – 80 % decisiones clínicas
basadas laboratorio**

Foubister V. CAP Today, Sept. 2000/ Datta P. Advance for the
Administrators of Laboratories, July 2005, p 60

**Laboratorio 5% coste sanitario e
interviene en 70 % decisiones clínicas**

Forsman R. Dark Report 2007

Evolución Medicina Laboratorio

Hace 50 años

10-15% diagnósticos con historia clínica + examen físico

75 % diagnósticos solo con historia clínica

Young et al. Am Ass Clin Chem, 1979

10- 15 % diagnósticos con resultado una prueba laboratorio

Actualidad

Laboratorio 64 % decisiones médicas

Kruse-Jarres JD. Lab Med 1994;18:213-6

70 – 80 % decisiones clínicas basadas laboratorio

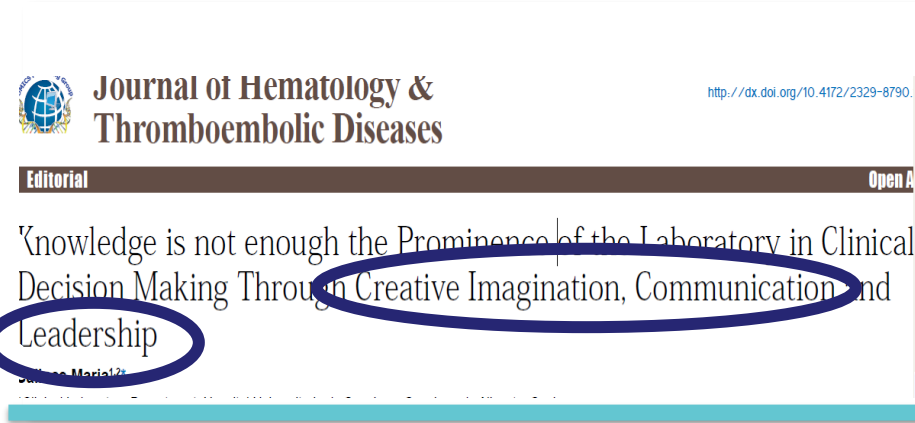
Foubister V. CAP Today, Sept. 2000/ Datta P. Advance for the Administrators of Laboratories, July 2005, p 60

Laboratorio 5% coste sanitario e interviene en 70 % decisiones clínicas

Forsman R. Dark Report 2007

Nuevo ROL profesional laboratorio

Conocimiento
No es suficiente



J Hematol Thromb Dis 2013; 1:3.



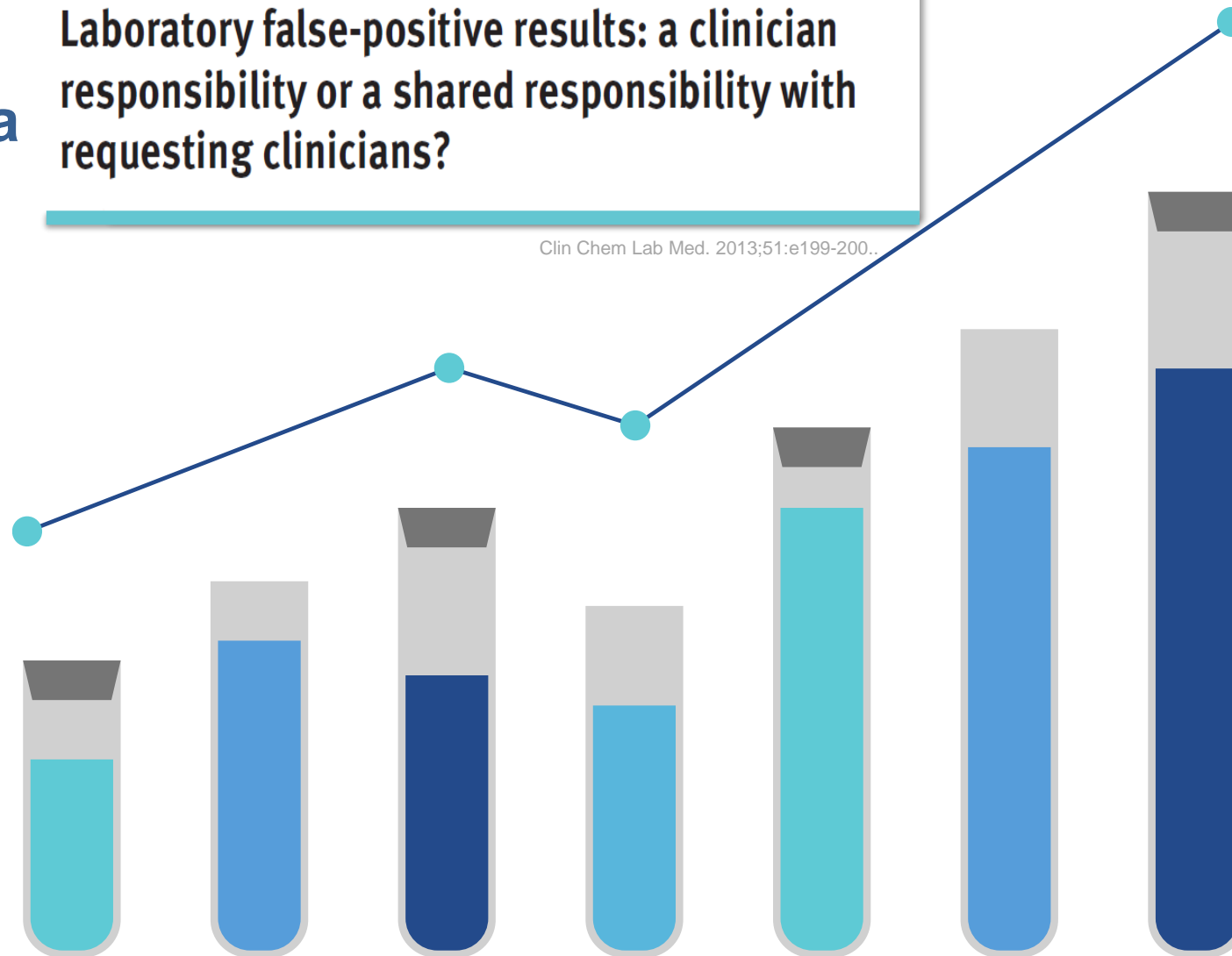
Nuevo ROL profesional laboratorio

Maria Salinas*, Maite Lopez-Garrigós, Lucía Flors and Carlos Leiva-Salinas

Laboratory false-positive results: a clinician responsibility or a shared responsibility with requesting clinicians?

Clin Chem Lab Med. 2013;51:e199-200..

**Conocimiento
Prueba adecuada**



Nuevo ROL profesional laboratorio

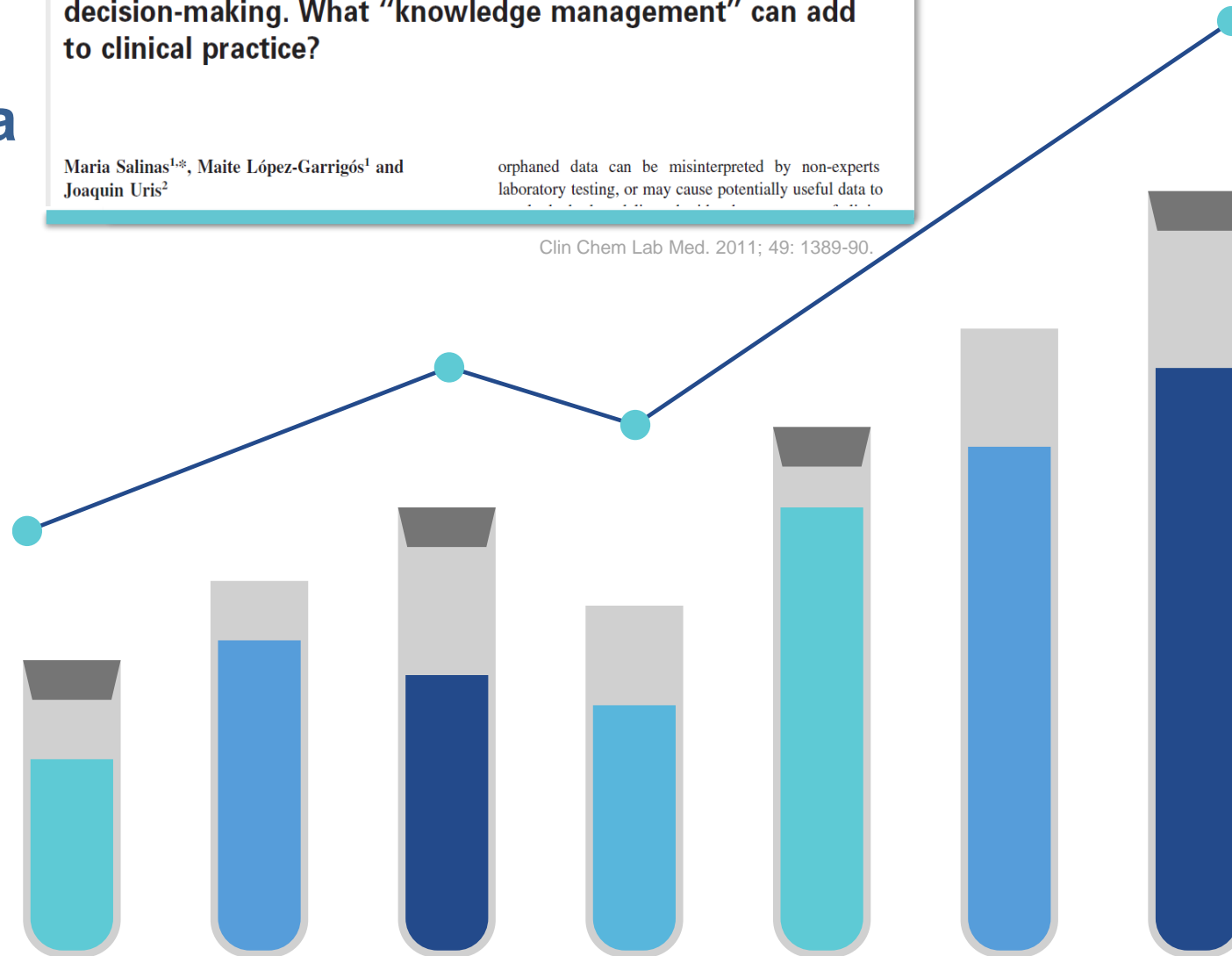
Conocimiento
Acción adecuada

Towards laboratory knowledge, not data, in 70% of clinical decision-making. What "knowledge management" can add to clinical practice?

Maria Salinas^{1,*}, Maite López-Garrigós¹ and Joaquin Uris²

Orphaned data can be misinterpreted by non-experts laboratory testing, or may cause potentially useful data to be overlooked.

Clin Chem Lab Med. 2011; 49: 1389-90.

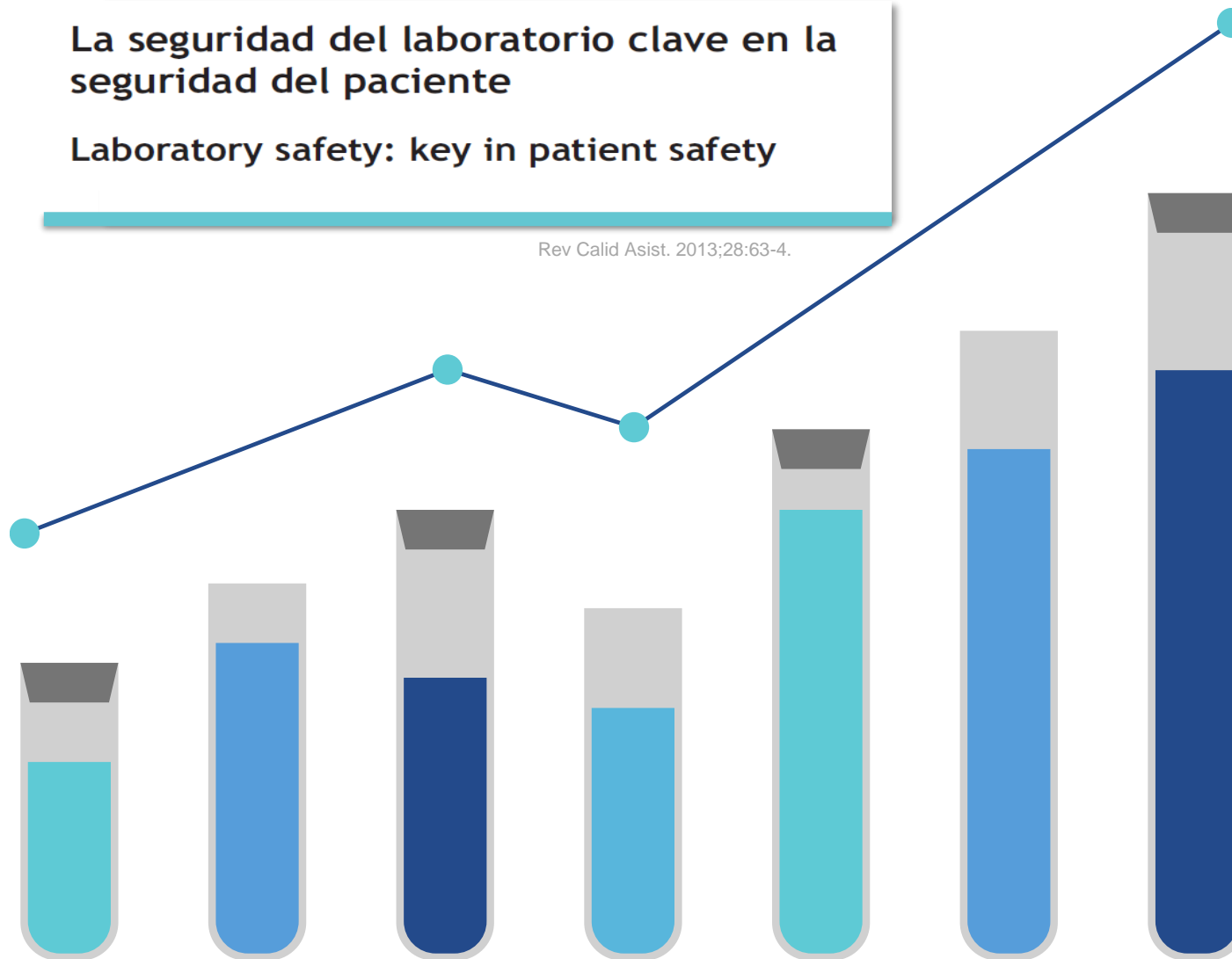


Medicina de Laboratorio: Laboratorio y MAS ALLÁ

La seguridad del laboratorio clave en la seguridad del paciente

Laboratory safety: key in patient safety

Rev Calid Asist. 2013;28:63-4.

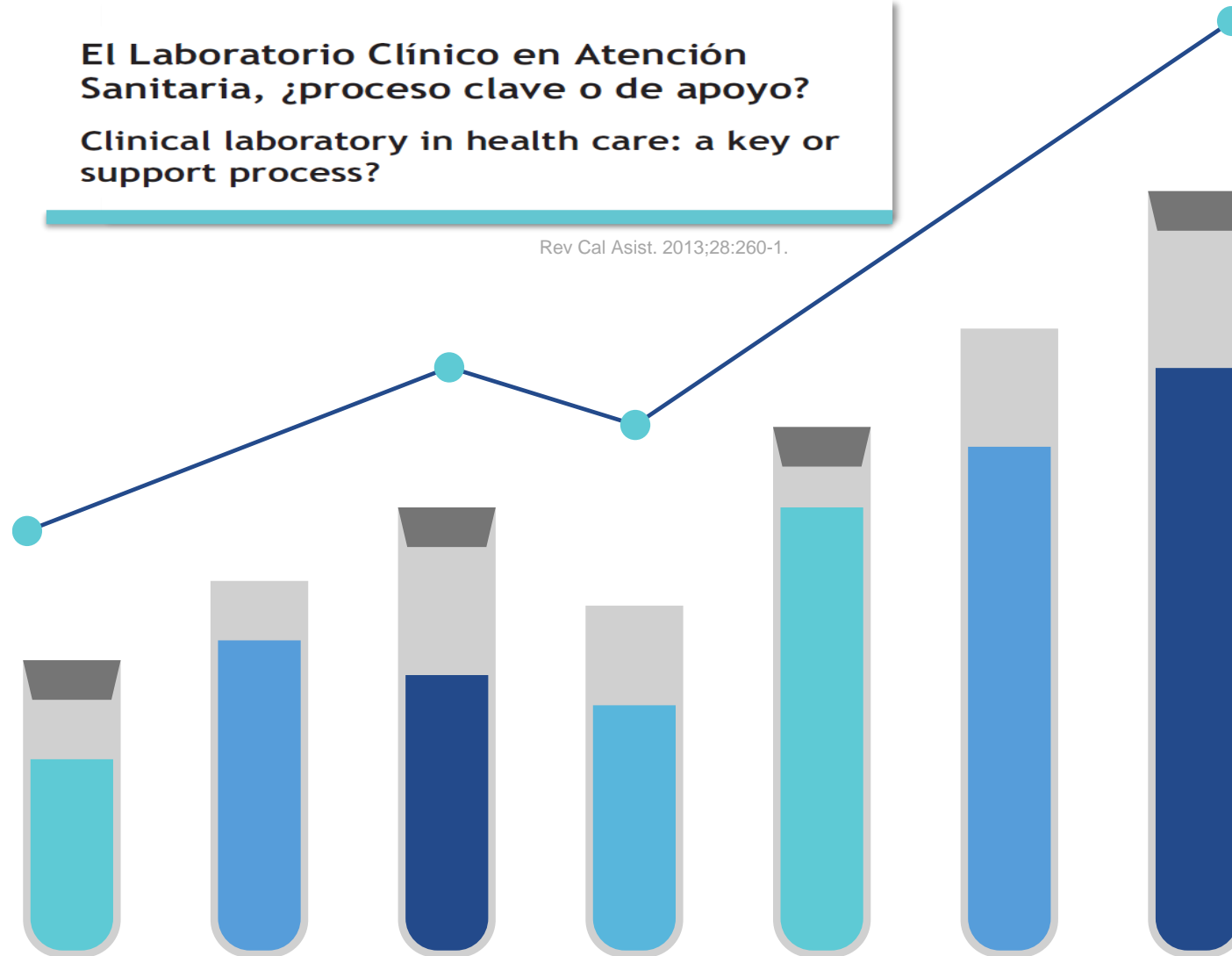


Medicina de Laboratorio

El Laboratorio Clínico en Atención Sanitaria, ¿proceso clave o de apoyo?

Clinical laboratory in health care: a key or support process?

Rev Cal Asist. 2013;28:260-1.



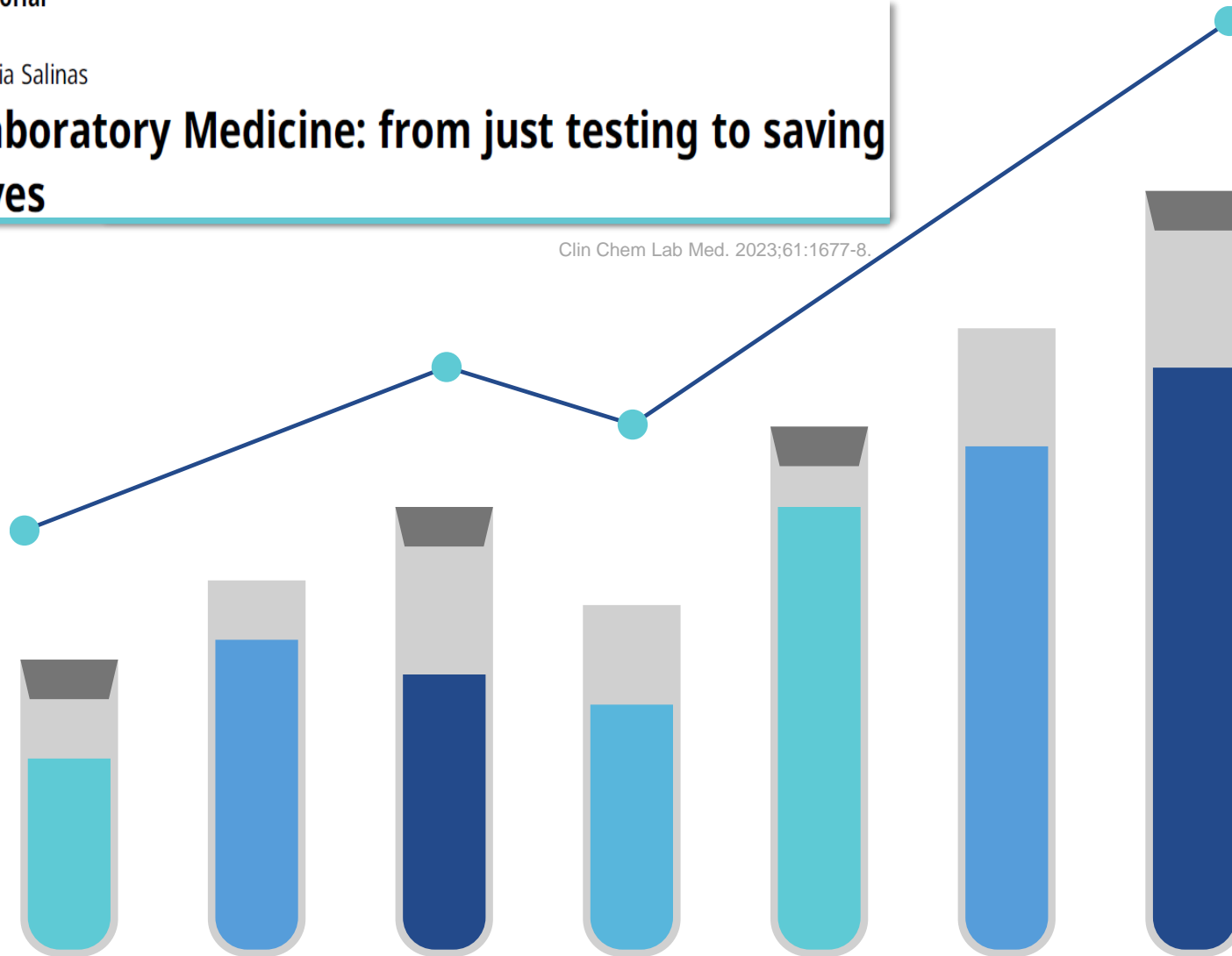


Editorial

Maria Salinas

Laboratory Medicine: from just testing to saving lives

Clin Chem Lab Med. 2023;61:1677-8.





MODULACION DE LA DEMANDA EN EL LABORATORIO CLINICO UN RETO PARA SEGURIDAD PACIENTE

GRACIAS

mariasalinaslacasta@gmail.com



**SANT JOAN
D'ALACANT**
DEPARTAMENT DE SALUT

Dra. María Salinas

Hospital Universitario San Juan de Alicante



**GENERALITAT
VALENCIANA**

Conselleria de Sanitat
Universal i Salut Pública