

# 69

## CONGRESO NACIONAL

SOCIEDAD ESPAÑOLA DE FARMACIA HOSPITALARIA

A CORUÑA

17-19 OCT 24



FARMACIA  
360°

ABRAZANDO LA EXCELENCIA

CUIDANDO EN

TODAS LAS DIRECCIONES

## ATENCIÓN INICIAL Y MULTIDISCIPLINAR DEL PACIENTE POLITRAUMATIZADO (CÓDIGO PPT):

ATENCIÓN INTEGRAL DESDE URGENCIAS HASTA EL MANEJO EN LA UNIDAD DE CUIDADOS

### Atención farmacéutica en el Servicio de Urgencias y Emergencias

**Javier Ramos Rodríguez**

Farmacéutico especialista, área de Urgencias y Emergencias

Servicio de Farmacia



No tengo índice  
de contenidos  
porque me  
pongo menos  
nervioso si  
improviso



## Hospital Universitario de Gran Canaria Doctor Negrín



R2 - 2017

Héctor Alonso Ramos





VERIFIED TRAUMA CENTER

**Santa Clara Valley  
Medical Center**

751 S Bascom Ave, San Jose, CA 95128  
Level I Adult, Level II Pediatric  
Trauma Center



R4 - 2019

**Chilla Wiersema,  
PharmD  
Caroline Ko,  
PharmD**







Dra. Andrea Campos  
Cirugía General y Digestiva – Área de Urgencias







## EL RETO DE LA ATENCIÓN FARMACÉUTICA EN LOS SERVICIOS DE URGENCIAS



Código PPT



Código SEPSIS



Código ICTUS



Código IAM

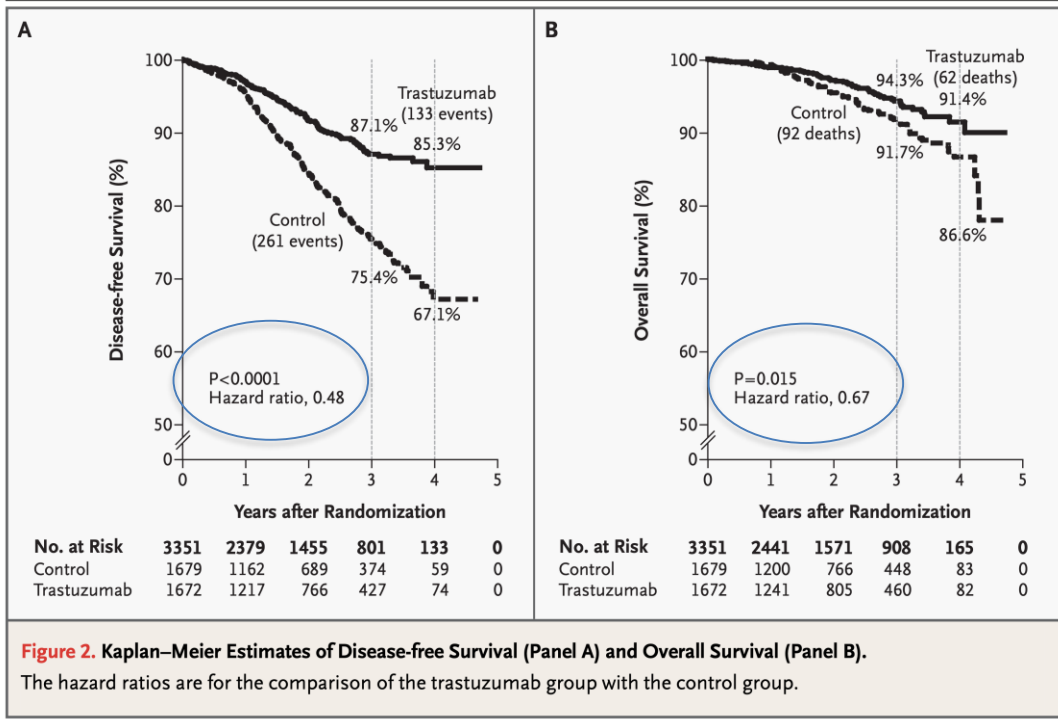


## Trastuzumab plus Adjuvant Chemotherapy for Operable HER2-Positive Breast Cancer

Authors: Edward H. Romond, M.D., Edith A. Perez, M.D., John Bryant, Ph.D., Vera J. Suman, Ph.D., Charles E. Geyer, Jr., M.D., Nancy E. Davidson, M.D., Elizabeth Tan-Chiu, M.D., and Norman Wolmark, M.D. [Author Info & Affiliations](#)

Published October 20, 2005 | N Engl J Med 2005;353:1673-1684 | DOI: 10.1056/NEJMoa052122

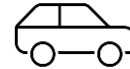
VOL. 353 NO. 16



## Situación clínica inestable, grave o muy grave

### ASHP Guidelines on Emergency Medicine Pharmacist

**Resuscitation.** EMPs should be present during all critical and acute resuscitative efforts in the ED. Initial studies of the role of EMPs in the resuscitation of trauma patients found improved safety from decreased preventable adverse medication events and expedited time to medication administration.<sup>19-22</sup> In addition to trauma resuscitation, EMPs provide value in a number of clinical emergencies, such as stroke, myocardial infarction, cardiac and respiratory arrest, airway compromise requiring rapid sequence intubation and postintubation care, and other medical emergencies. The role of



Código PPT



Código ICTUS



Código SEPSIS



Código IAM



**“Código INTOXICACIÓN”**

## DOCUMENTO DE CONSENSO

## Atención farmacéutica en los servicios de urgencias: documento de posicionamiento de la Sociedad Española de Farmacia Hospitalaria (SEFH) y la Sociedad Española de Medicina de Urgencias y Emergencias (SEMES)

Jesús Ruiz Ramos<sup>1,3</sup>, Beatriz Calderón Hernanz<sup>1,4</sup>, Yolanda Castellanos Clemente<sup>1,5</sup>, Manuel Bonete Sánchez<sup>1,6</sup>, Emili Vallve Alcon<sup>1,7</sup>, M.<sup>a</sup> Rosario Santolaya Perrin<sup>1,8</sup>, M.<sup>a</sup> Ángeles García Martín<sup>1,9</sup>, Ana de Lorenzo Pinto<sup>1,10</sup>, José Manuel Real Campaña<sup>1,11</sup>, Javier Ramos Rodríguez<sup>1,12</sup>, Cristina Calzón Blanco<sup>1,13</sup>, Milagros García Peláez<sup>1,14</sup>, Héctor Alonso Ramos<sup>1,15</sup>, Joan Altimiras Ruiz<sup>1,16</sup>, Paloma Sempere Serrano<sup>1,17</sup>, María Martín Cerezuela<sup>1,18</sup>, Leonor Periañez Parraga<sup>1,19</sup>, Ana María Juanes Borrego<sup>2,20</sup>, Beatriz Somoza Fernández<sup>1,10</sup>, Juan Manuel Rodríguez Camacho<sup>4,21</sup>, Mireia Puig Campmany<sup>2,3</sup>, Iria Miguens Blanco<sup>2,10</sup>, Santiago Tomás Vecina<sup>2,2</sup>, Catalina Nadal Galmes<sup>2,4</sup>, Javier Povar Marco<sup>2,11</sup>

Ruiz Ramos J, et al. Emergencias 2023;35:205-217



**Figura 2.** Actividades que realizar por los farmacéuticos de urgencias.  
AAM: acontecimientos adversos a medicamentos.



Air Medical Journal 41 (2022) 128–132

Contents lists available at ScienceDirect

**Air Medical Journal**

journal homepage: <http://www.airmedicaljournal.com/>

Review Article

Pharmacy in Flight: Impact of Clinical Pharmacist in Prehospital Care

Kelsey Beatrous, PharmD<sup>\*</sup>, Stephanie Tesseneer, PharmD, Damon Darsey, MD

Mississippi Center for Emergency Services, University of Mississippi Medical Center, Jackson, MS

journal homepage: [www.elsevier.com/locate/ajem](http://www.elsevier.com/locate/ajem)

Clinical pharmacy services in the emergency department

Sofie Rahman Morgan, MD, MBA<sup>1</sup>, Nicole M. Acquisto, PharmD<sup>2,3,4</sup>, Zlatan Coralic, PharmD, BCPS<sup>1,5</sup>, Vicki Basalyga, PharmD, BCPS, BCPPS<sup>1</sup>, Matthew Campbell, PharmD, BCPS, BCCCP<sup>1</sup>, John J. Kelly, DO<sup>1</sup>, Kevin Langkiet, PhD(c), MSN, RN<sup>4</sup>, Claire Pearson, MD, MPH<sup>1</sup>, Erick Soka, PharmD, MS, BCPS<sup>1</sup>, Michael Phelan, MD<sup>1</sup>

ist in drug-assisted intubation at a newly established children's major trauma center

Kevin Enright<sup>1</sup>, Shazia Akram<sup>1</sup>, Anna Hussain<sup>1</sup>, Colin V. E. Powell<sup>1,2</sup>

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RESEARCH

**Pharmacist's Impact on Acute Pain Management During Trauma Resuscitation**

Kayla Montgomery, PharmD, BCPS<sup>1</sup>, A. Brad Hall, PharmD<sup>1</sup>, Georgia Keriazas, PharmD, BCPS, BCOF<sup>1</sup>

RAPID-SEQUENCE INTUBATION PRACTICE RESEARCH REPORTS

Effectiveness of interventions to improve medication use during rapid-sequence intubation in a pediatric emergency department

**Pharmacist's activities on a trauma response team in the emergency department**

ASAD E. PATANWALA AND DANIEL P. HAYS

**Pharmacology in Emergency Medicine**

IMPACT OF CLINICAL PHARMACISTS ON INITIATION OF POSTINTUBATION ANALGESIA IN THE EMERGENCY DEPARTMENT

Erin Robey-Gavin, PharmD and Lames Abuakar, PharmD

Department of Pharmacy, Mercy Hospital and Medical Center, Chicago, Illinois  
Corresponding Address: Erin Robey-Gavin, nurse, Department of Pharmacy, Mercy Hospital and Medical Center, 2125 S Michigan Ave, Chicago, IL 60616

**The Role of the Emergency Pharmacist in Trauma Resuscitation**

Thomas R. Scarponcini, MS<sup>1</sup>, Christopher J. Edwards, PharmD<sup>1</sup>, Maria I. Rudis, PharmD, DABAT, FCCM<sup>1</sup>, Karalea D. Jasiak, PhD<sup>1</sup>, Daniel P. Hays, PharmD, BCPS<sup>1</sup>

NIH National Library of Medicine National Center for Biotechnology Information

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> Am J Health Syst Pharm. 2020 Jun 4;77(12):918-921. doi: 10.1093/ajhp/zxaa082.

**Collaboration by emergency medicine pharmacists and prehospital services providers**

Nicole M Acquisto<sup>1</sup>, Jeremy T Cushman<sup>2</sup>, Amber D Rice<sup>3</sup>, Christopher J Edwards<sup>4</sup>

Affiliations + expand  
PMID: 32377687 DOI: 10.1093/ajhp/zxaa082

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NIH National Library of Medicine National Center for Biotechnology Information

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> Am J Health Syst Pharm. 2015 Jan 1;72(1):61-3. doi: 10.2146/ajhp140038.

**Pharmacist input into statewide treatment protocols for emergency medical services**

Meghan E Groth<sup>1</sup>, Wesley D McMillan<sup>2</sup>, Daniel L Wolfson<sup>2</sup>

Affiliations + expand  
PMID: 25511840 DOI: 10.2146/ajhp140038

FULL TEXT LINKS  
OXFORD ACADEMIC

ACTIONS  
Cite Collections



### The Role of the Emergency Pharmacist in Trauma Resuscitation

Thomas R. Scarponcini, MS<sup>1</sup>, Christopher J. Edwards, PharmD<sup>2</sup>,  
Maria I. Rudis, PharmD, DABAT, FCCM<sup>3</sup>, Karalea D. Jasiak, PharmD<sup>4</sup>, and  
Daniel P. Hays, PharmD, BCPS<sup>5</sup>

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24(2) 146-159  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/0897190111400530  
http://jpp.sagepub.com  
SAGE

*“Dedicated trauma teams are associated with improved patient care and a decrease in time to procedures or specialized care”*

## Institute of Medicine (IOM)

*“To Err is Human”*

### Urgencias

alta carga asistencial + atención fragmentada +  
pacientes y situaciones complejas de alto riesgo

1er curso Advanced Trauma Life Support (ATLS) 1978

Brent RJ, Poltorak I. The pharmacist as a trauma team member. Hosp Pharm. 1987;22(2):152-155.

Reducir errores

Farmacoterapia apropiada, segura y en el tiempo adecuado

Adherencia a guías clínicas

Evaluación de alergias, fármacos crónicos e inmunización previa



**A**IRWAY



**B**REATHING



**C**IRCULATION



**D**ISABILITY



**E**XPOSURE

## Secuencia de inducción e intubación rápida<sup>5-6</sup>



AIRWAY

“7 Ps”

1. *Preparation*
2. *Preoxygenation*
3. *Preintubation optimization*
4. *Paralysis with induction*
5. *Positioning*
6. *Placement with proof*
7. *Postintubation management*

# Secuencia de inducción e intubación rápida<sup>5-6</sup>

## *Paralysis with induction*

-> Administración de agente inductor y relajante muscular



sedación + parálisis en 45-60 segundos



1. *Preparation*
2. *Preoxygenation*
3. *Preintubation optimization*
4. *Paralysis with induction*
5. *Positioning*
6. *Placement with proof*
7. *Postintubation management*

1

Agente inductor → Ideal: acción rápida + analgesia + HDME





2

Bloqueante neuromuscular → Ideal: acción rápida + analgesia/sedación



# Secuencia de inducción e intubación rápida<sup>5-6</sup>

 sedación + parálisis en 45-60 segundos 

Ideal: acción rápida + analgesia + HDME

1. Preparation
2. Preoxygenation
3. Preintubation optimization
4. Paralysis with induction
5. Positioning
6. Placement with proof
7. Postintubation management

1

## Agente inductor

### VENTAJAS



### CONTRAINDICACIÓN



### PRECAUCIÓN



**Etomidato**

0.3 mg/kg

Sedación excelente  
Hipotensión leve

**Insuficiencia  
adrenocortical**

**Precaución: sepsis  
(glucocorticoides)**

**Ketamina**

1 - 2 mg/kg

Estimulación  
catecolaminérgica y  
broncodilatación

**HTA + PIC elevada  
¿controversia?**

**Broncoespasmo + shock séptico + HIPOtensión  
EXCELENTE**

**Midazolam**

0.2 - 0.3 mg/kg

Amnesia  
dosis-dependiente

**Depresión miocárdica  
dosis-dependiente: HIPOtensión**

**Infradosificación**

**Propofol**

1.5 - 3 mg/kg

Broncodilatación

**HIPOtensión dosis-dependiente**

**Tiopental**

2

## Bloqueante neuromuscular

Succinilcolina

1.5 mg/kg

vs Rocuronio -> mejores condiciones para IOT, superior en el 1er intento de IOT

**Importante dosis:** sobredosificar no aumenta el riesgo  *Systematic review + RCT* vs **vida real** (mismo nivel de parálisis) vs **infradosificar (dificulta IOT)**

### Contraindicaciones

- Hipertermia maligna (personal/familiar)
- Hiperpotasemia
- Enfermedades neuromusculares
- Ictus > 72h
- Rabdomiólisis
- Quemaduras > 72h

Rocuronio

1.5 mg/kg

**Elección si contraindicación a Succinilcolina o previsión de IOT prolongada**

**Importante dosis:** **infradosificar dificulta IOT<sup>15-17</sup>** (común en servicios de urgencias)

 Contraindicación (relativa)

- Predicción vía aérea difícil



**IV Bolus**  
**20 mL SF 0.9%**  
**post-rocuronio**  
IOT  
+ rápida y duradera

sedación + parálisis en 45-60 segundos



→ t ½ fármacos en IOT

## IOT prolongada



↑ FC o HTA → sedación y/o analgesia inadecuada

1. Preparation
2. Preoxygenation
3. Preintubation optimization
4. Paralysis with induction
5. Positioning
6. Placement with proof
7. Postintubation management

### Sedación



### Acción

### Duración

### Bloqueo NM

### Acción

### Duración

**Etomidato**

30 - 60 segundos

3 - 5 minutos

**Succinilcolina**

< 60 segundos

4 - 10 minutos  
(< en pediatría)

**Ketamina**

30 segundos

5 - 10 minutos  
(recuperación 1-2 horas)

**Rocuronio**

1 - 2 minutos

30 - 60 minutos  
(< en pediatría)

**Midazolam**

1 - 5 minutos

< 2 horas  
(dosis dependiente)

**Propofol**

10 - 50 segundos

3 - 10 minutos  
(dosis dependiente)

Anticipar la IOT prolongada para administrar sedoanalgesia a tiempo

## ORIGINAL ARTICLE

## A Multidisciplinary Approach to Adverse Drug Events in Pediatric Trauma Patients in an Adult Trauma Center

Michael Kalina, DO, Glen Tinkoff, MD, Wendy Gleason, RN, Paula Veneri, RN, and Gerard Fulda, MD

## Errores de medicación



## Prescripción Administración

**Métodos:** creación de equipo multidisciplinar con pediatra, enfermería pediátrica, coordinador de pediatría, trauma y farmacéutico/a → atención del PPT pediátrico (*Pediatric Care Team*)  
**1 año de estudio** (grupo control año previo sin *Pediatric Care Team*)

**Resultados:** 134 pacientes vs 125 en grupo control

1. Reducción de **40%** errores de prescripción (25 vs 15,  $p=0.05$ )
2. Reducción de **53%** errores de administración (19 vs 9,  $p=0.005$ )
3. Aumento en documentación del peso del paciente (90 vs 81%,  $p=0.048$ )

### Fármacos implicados

- Morfina
- Paracetamol
- Lamotrigina
- Fentanilo
- Propofol
- Ranitidina



Mayoría de  
estudios en SIIR

**Evidencia limitada**

Efectividad mejores condiciones de IOT  
y/o minimizar RAM

Estandarización farmacoterapia  
utilizada y tiempos de administración

RAPID-SEQUENCE INTUBATION

PRACTICE RESEARCH REPORTS

Effectiveness of interventions to improve medication use during rapid-sequence intubation in a pediatric emergency department



*“video camera and a microphone, which record continuously (manual activation is not required), established part of ED quality assurance, peer review, and research activities”*

Estudio pre y post intervención

## Objetivos

- 1 Estandarizar farmacoterapia en SIIR
- 2 Mejorar tiempos de administración

Enero 2011

Abril 2014

Retrospectivo  
18 meses  
*run-in period*  
(3 meses video)

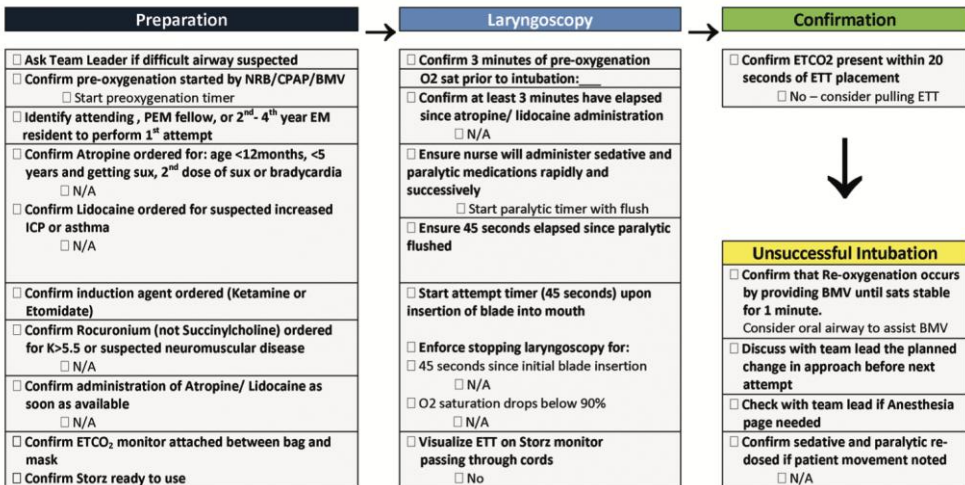
Checklist period  
12 meses

Checklist + card period  
10 meses



## Rapid Sequence Intubation Checklist

Checklist to be used by 2<sup>nd</sup> attending



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## Rapid Sequence Intubation

### PREMEDICATIONS

- Atropine** (age <12months; <5 years and getting **Succinylcholine**; 2nd dose of **Succinylcholine**; bradycardia)
  - N/A
- Lidocaine** (suspected increased ICP or asthma)
  - N/A
- Hand-off **Atropine** and/or **Lidocaine** to RN team leader to be administered as soon as available
  - N/A

### RSI MEDICATIONS

#### Sedative

- Etomidate
- Ketamine
- Fentanyl (heart dz with septic shock, 4 mcg/kg)

#### Paralytic

- Succinylcholine
- Rocuronium (K>5.5; suspected neuromuscular disease; malignant hyperthermia – patient or family history)

### FAILED INTUBATION / REPEAT COURSE OF RSI

- Premedicate with **Atropine** if not already given and if administering 2nd dose of **Succinylcholine**
- Draw up 2nd doses of both sedative and paralytic; hand to RN team leader

### POST-INTUBATION MEDICATIONS

Draw up during RSI upon order from MD

- Fentanyl
- Vecuronium

### AFTER RSI HAS BEEN COMPLETED

- Put patient sticker on back of checklist & deposit completed checklist in lockbox
- Discard any opened vials of medication
- Return unopened vials to Pyxis return bin or locked cabinet in "B" Med Room
- If meds were prepared but none were given, "waste" kit in Pyxis

**Table 1.** Characteristics of Patients Undergoing Rapid-Sequence Intubation<sup>a</sup>

Characteristic <sup>a</sup>	Period		
	Historical (n = 136)	Checklist (n = 68)	Checklist/Card (n = 49)
Age			
Median, yr (IQR)	3.4 (1.0–10.0)	2.4 (0.3–10.6)	3.6 (0.4–12.4)
<1 yr, no. (%)	34 (25)	24 (35)	14 (29)
Diagnostic category, no (%) <sup>b</sup>			
Trauma	34 (25)	17 (25)	9 (18)
Medical	102 (75)	51 (75)	40 (82)
PRISM III score, median (IQR) <sup>c</sup>	7 (5–13)	7 (4–15)	5 (3–8)
Bradycardia, no. (%) <sup>d</sup>	11 (8)	3 (4)	3 (6)
Hyperkalemia, no. (%) <sup>e</sup>	17 (15)	14 (25)	8 (16)

<sup>a</sup>IQR = interquartile range, PRISM = Pediatric Risk of Mortality.

<sup>b</sup>Seven patients had unclear diagnostic categories: 2 in the run-in phase of the historical period, 1 in the checklist period, and 4 in the checklist/card period. The study team discussed these patients and reached consensus on the most appropriate category.

<sup>c</sup>For PRISM III scores, *n* = 123 for historical period, *n* = 55 for checklist period, and *n* = 42 for checklist/card period.

<sup>d</sup>2010 Pediatric Advanced Life Support guidelines.<sup>12</sup>

<sup>e</sup>Serum potassium concentration of >5.5 mmol/L; *n* = 112 for historical period, *n* = 56 for checklist period, and *n* = 43 for checklist/card period.

**Table 4.** Timing of Medication Administration During Rapid-Sequence Intubation

Variable <sup>a</sup>	Period			<i>p</i>
	Run-in (n = 18)	Checklist (n = 68)	Checklist/ Card (n = 49)	
No. (%) patients receiving premedication >3 min before RSI induction agent <sup>b</sup>	10 (55)	30 (44)	31 (78)	0.28
Median time from flushing of RSI sedative through flushing of NMB, sec (IQR)	28 (23–44)	21 (16–32)	19 (15–25)	0.004
No. (%) patients for whom RSI sedative and NMB administered in <30 sec	10 (56)	50 (74)	43 (88)	0.005
No. (%) patients for whom 45 sec elapsed between flushing of NMB and start of laryngoscopy <sup>c</sup>	8 (44)	40 (59)	34 (69)	0.059

<sup>a</sup>RSI = rapid-sequence intubation, NMB = neuromuscular blocker, IQR = interquartile range.

<sup>b</sup>Three-minute lapse between last premedication (atropine or lidocaine) and RSI sedative intended to ensure activity of premedications.

<sup>c</sup>A 45-second pause intended to ensure adequate paralysis at start of laryngoscopy.

## Pharmacology in Emergency Medicine



### IMPACT OF CLINICAL PHARMACISTS ON INITIATION OF POSTINTUBATION ANALGESIA IN THE EMERGENCY DEPARTMENT

Erin Robey-Gavin, PHARM.D and Lamies Abuakar, PHARM.D

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Pacientes con VM + IOT



**Dolor, ansiedad por “molestia” física y emocional del TET, modalidad ventilatoria, BNM y maniobras de resucitación**

Incomunicación -> HTA + taquicardia  
poco fiable  
debido al uso concomitante de fármacos

Analgésia post-SIIR en URG: 46-51% ausente/inadecuada (solo bolus opioide)

→ **Preintervention** (January 1, 2010–June 30, 2010)

**FORMACIÓN SEDOANALGESIA – INFO.FARMACOS IMPRESA – PRESENCIA FÍSICA**

→ **Postintervention** (January 1, 2011–June 30, 2011)

### Objetivos

- 1. Inicio precoz de analgesia post-SIIR en URG**
- 2. Frecuencia uso sedante y ansiolíticos sin analgesia, tiempo de inicio de analgesia, RAM con suspensión de fármaco causante**



**Pharmacology in  
Emergency Medicine**



**IMPACT OF CLINICAL PHARMACISTS ON INITIATION OF POSTINTUBATION  
ANALGESIA IN THE EMERGENCY DEPARTMENT**

Erin Robey-Gavin, PHARM.D and Lamies Abuakar, PHARM.D

Department of Pharmacy, Mercy Hospital and Medical Center, Chicago, Illinois

Corresponding Address: Erin Robey-Gavin, PHARM.D, Department of Pharmacy, Mercy Hospital and Medical Center, 2525 S Michigan Ave,  
Chicago, IL 60616

**RESULTADOS**

1. Inicio precoz de analgesia post-SIIR en URG
2. Frecuencia uso sedante y ansiolíticos **sin analgesia**, tiempo de inicio de analgesia, RAM con suspensión de fármaco causante

Increased after clinical pharmacist intervention

**20% to 49% (p = 0.005)**

10 AM - 8:30 PM (presencia FH)

**50% of analgesic** use in the **preintervention** group

**85% in the postintervention** group

**73% sole sedative/ansiolytic preintervention** group

**51% in the postintervention** group (p=0.04)

**98 min vs 45 min en postintervention group (54%)**



BREATHING

Articles

## Ceftriaxone to prevent early ventilator-associated pneumonia in patients with acute brain injury: a multicentre, randomised, double-blind, placebo-controlled, assessor-masked superiority trial



Claire Dahyot-Fizelier, Sigismond Lasocki, Thomas Kerforne, Pierre-Francois Perrigault, Thomas Geeraerts, Karim Asehounne, Raphaël Cinotti, Yoann Launey, Vincent Cottencaeu, Marc Laffon, Thomas Gaillard, Matthieu Boisson, Camille Aleyrat, Denis Frasca, Olivier Mimoz, on behalf of the PROPHY-VAP Study Group and the ATLANREA Study Group\*

Open access

Guidelines/Algorithms

Trauma Surgery  
& Acute Care Open

## Antibiotic prophylaxis for tube thoracostomy placement in trauma: a practice management guideline from the Eastern Association for the Surgery of Trauma

Jennifer J Freeman <sup>1</sup>, Sofya H Asfaw,<sup>2</sup> Cory J Vatsaas,<sup>3</sup> Brian K Yorkgitis <sup>4</sup>,  
 Krista L Haines,<sup>3</sup> J Bracken Burns,<sup>5</sup> Dennis Kim,<sup>6</sup> Erica A Loomis,<sup>7</sup> Andy J Kerwin,<sup>4</sup>  
 Amy McDonald,<sup>8</sup> Suresh Agarwal, Jr.,<sup>3</sup> Nicole Fox,<sup>9</sup> Elliott R Haut <sup>10</sup>,  
 Marie L Crandall <sup>4</sup>, John J Como <sup>11</sup>, George Kasotakis <sup>3</sup>



CIRCULATION

Os lo ha contado todo la Dra. Barquero, y no se puede competir con ella...



**DISABILITY**

**Tranexámico** en TCE

## Secuencia de inducción e intubación rápida Sedoanalgesia post IOT

Hipertensión intracraneal

## Hipertónico vs Manitol en TCE

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**Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial**

*The CRASH-3 trial collaborators\**

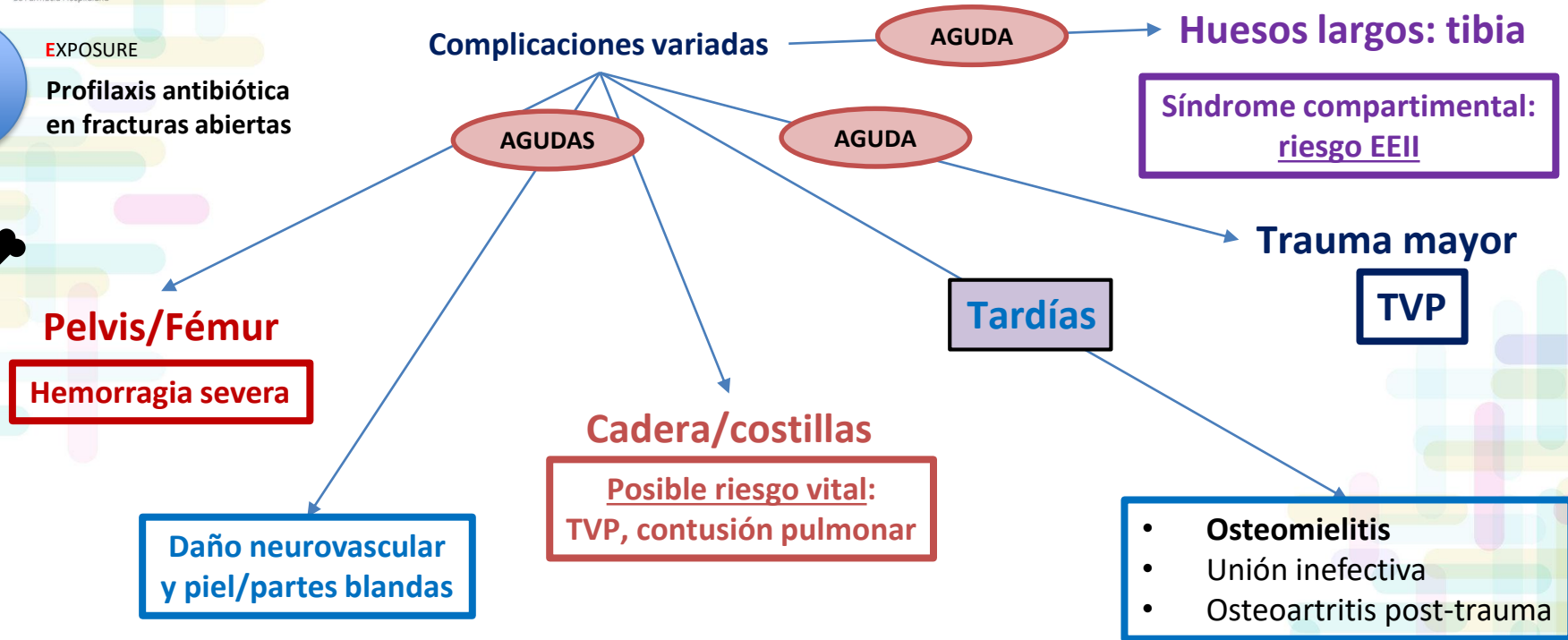


EXPOSURE

**Profilaxis antibiótica  
en fracturas abiertas**



## Complicaciones variadas





## Contaminación de una fractura abierta

Complicaciones tardías

Osteomielitis

25 % - factores de riesgo



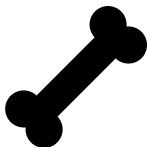
Gravedad + daño NV  
Grado de contaminación  
Tiempo y efectividad del desbridamiento  
Optimización del tratamiento ATB

### Microorganismos

*Staphylococcus aureus*, *staphylococcus*  
coagulasa-negativo y BGN

*Enterococcus*, anaerobios, hongos, y  
micobacterias

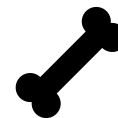
Agua: *Pseudomonas*,  
*Aeromonas* o *Vibrio* sp



Gustilo-Anderson open fracture grading

Clasificación de las fracturas abiertas

## Gustilo-Anderson open fracture grading<sup>39-40</sup>



Tipo	Tamaño herida	Contaminación	Daño óseo	Daño vascular	Reserva piel/partes blandas
I	< 1cm	Mínima	Mínimo	No	Adecuada
II	> 1 cm	Moderada	Moderado		
IIIA	Cualquier tamaño	Severa	Severo Fractura conminuta Desprendimiento periostio	Si	Inadecuada con desbridamiento
IIIB					Inadecuada
IIIC					

## Prevención de osteomielitis

Desbridamiento precoz



Primeras 6 horas ¿?

Riesgo de infección elevado si > 12h:  
**Fractura de tibia, tibia Tipo IIIB**

Fijación (si es necesaria)

Profilaxis antibiótica



Primeras 6 horas

Prodromidis AD, Charalambous CP. The 6-Hour Rule for Surgical Debridement of Open Tibial Fractures: A Systematic Review and Meta-Analysis of Infection and Nonunion Rates. J Orthop Trauma. 2016 Jul;30(7):397-402. doi: 10.1097/BOT.0000000000000573. PMID: 26978135. Schenker ML, Yannascoli S, Baldwin KD, Ahn J, Mehta S. Does timing to operative debridement affect infectious complications in open long-bone fractures? A systematic review. J Bone Joint Surg Am. 2012 Jun 20;94(12):1057-64. doi: 10.2106/JBJS.K.00582. PMID: 22572980. Calhoun JH. Optimal timing of operative debridement: a known unknown: commentary on an article by Mara L. Schenker, MD, et al.: "Does timing to operative debridement affect infectious complications in open long-bone fractures? A systematic review". J Bone Joint Surg Am. 2012 Jun 20;94(12):e90. doi: 10.2106/JBJS.L.00239. PMID: 22573021. Foote CJ, Tornetta P 3rd, Reito A, Al-Hourani K, Schenker M, Bosse M, Coles CP, Bozzo A, Furey A, Leighton R; GOLIATH Investigators. A Reevaluation of the Risk of Infection Based on Time to Debridement in Open Fractures: Results of the GOLIATH Meta-Analysis of Observational Studies and Limited Trial Data. J Bone Joint Surg Am. 2021 Feb 3;103(3):265-273. doi: 10.2106/JBJS.20.01103. Erratum in: J Bone Joint Surg Am. 2021 Mar 17;103(6):e25. PMID: 33298796. Patzakis MJ, Wilkins J, Moore TM. Considerations in reducing the infection rate in open tibial fractures. Clin Orthop Relat Res. 1983 Sep;(178):36-41. PMID: 6883867. Seligson D, Henry SL. Treatment of compound fractures. Am J Surg. 1991 Jun;161(6):693-701. doi: 10.1016/0002-9610(91)91258-k. PMID: 1907431. Patzakis MJ, Bains RS, Lee J, Shepherd L, Singer G, Ressler R, Harvey F, Holtom P. Prospective, randomized, double-blind study comparing single-agent antibiotic therapy, ciprofloxacin, to combination antibiotic therapy in open fracture wounds. J Orthop Trauma. 2000 Nov;14(8):529-33. doi: 10.1097/00005131-200011000-00002. PMID: 11149497. Gosselin RA, Roberts I, Gillespie WJ. Antibiotics for preventing infection in open limb fractures. Cochrane Database Syst Rev. 2004;2004(1):CD003764. doi: 10.1002/14651858.CD003764.pub2. PMID: 14974035; PMCID: PMC8728739.

**Ausencia de contaminación  
en el suelo/agua**

**Contaminación en el suelo**

**Contaminación en el  
agua**

I

Gram +

**Cefazolina 2 gr/8h**

**Alergia betalactámicos:**

**Vancomicina dosis de carga 20-35  
mg/kg (máx 3000 mg) + 15-20 mg/kg/8-12h**  
monitorización farmacocinética

**Cefazolina 2 gr/8h / Ceftriaxona 2 gr/24h  
+ Metronidazol 500 mg/8h**

**(+ Vanco si riesgo MRSA)**

**Alergia betalactámicos: Clindamicina 900 mg/8h**

II

IIIA

**Cefazolina 2 gr/8h +  
Gentamicina 5mg/kg/24h  
/ Ceftriaxona 2 gr/24h**

**Alergia betalactámicos:  
Clindamicina 900 mg/8h**

**Ceftriaxona 2 gr/24h + Metronidazol 500 mg/8h**  
**(+ Vanco si riesgo MRSA)**

**Cefazolina 2 gr/8h + Gentamicina 5mg/kg/24h +  
Metronidazol 500 mg/8h**

**Alergia betalactámicos  
Clindamicina 900 mg/8h + Gentamicina 5  
mg/kg/24h**

IIIB

Gram +  
Gram -

IIIC

**Agua dulce**  
**Piperacilina-Tazobactam 4.5 gr/6h**  
**(si riesgo MRSA: Vanco +  
Carbapenem \*Nefrotoxicidad)**  
**Alergia betalactámicos**  
**Imipenem 500 mg/6h /Meropenem  
1 gr/8h + Vanco si riesgo MRSA**

**Agua salada**  Vibrio sp  
**Asociar Doxiciclina 100 mg/12h**



**Duración**

Tipo I-II: cierre herida + 24h

Tipo III: 3 días / cierre herida + 24h

**Prolongarlo no aporta beneficio y favorece resistencias<sup>34,49</sup>**

Profilaxis  
Antitetánica

Dosis previa

< 3 dosis / desconocida

≥ 3 dosis

Periodo de incubación variable (3-8-21 días)  
Administración cuanto antes

Herida menor limpia

Vacuna toxoide\*

Inmunoglobulina

Si

Solo si la última  
dosis ≥ 10 años

No

Resto heridas

Vacuna toxoide\*

Inmunoglobulina

Si

Solo si la última  
dosis ≥ 5 años

Si

No

\* **DT**: diphtheria-tetanus toxoids adsorbed; **DTP/DTwP**: diphtheria-tetanus whole-cell pertussis; **DTap**: diphtheria-tetanus-acellular pertussis; **Td**: tetanus-diphtheria toxoids absorbed; **Tdap**: booster tetanus toxoid-reduced diphtheria toxoid-acellular pertussis; **TT**: tetanus toxoid.



> *J Trauma Acute Care Surg.* 2024 Apr 1;96(4):674-682. doi: 10.1097/TA.0000000000004233.  
Epub 2023 Dec 18.

# Antibiotic prophylaxis in trauma: Global Alliance for Infection in Surgery, Surgical Infection Society Europe, World Surgical Infection Society, American Association for the Surgery of Trauma, and World Society of Emergency Surgery guidelines

Federico Coccolini <sup>1</sup>, Massimo Sartelli, Robert Sawyer, Kemal Rasa, Marco Ceresoli, Bruno Viaggi, Fausto Catena, Dimitrios Damaskos, Enrico Cicuttin, Camilla Cremonini, Ernest E Moore, Walter L Biffi, Raul Coimbra

Affiliations + expand

PMID: 38108632 DOI: [10.1097/TA.0000000000004233](https://doi.org/10.1097/TA.0000000000004233)



May 1, 2014 - June 30, 2016

**Primary outcome:** proportion of patients with initial antibiotic prophylaxis in accordance with the EAST guidelines recommendations

**Secondary outcome:** door-to-antibiotic administration times

Time from injury to antibiotics, positive predictor of **infection**



1ª hora

## RESULTS

n=146

**Primary outcome**

With pharmacist **81%**  
Without pharmacist **47%**  
p<0.01

**Secondary outcome**

With pharmacist **14 min**  
Without pharmacist **20 min**  
P=0.02

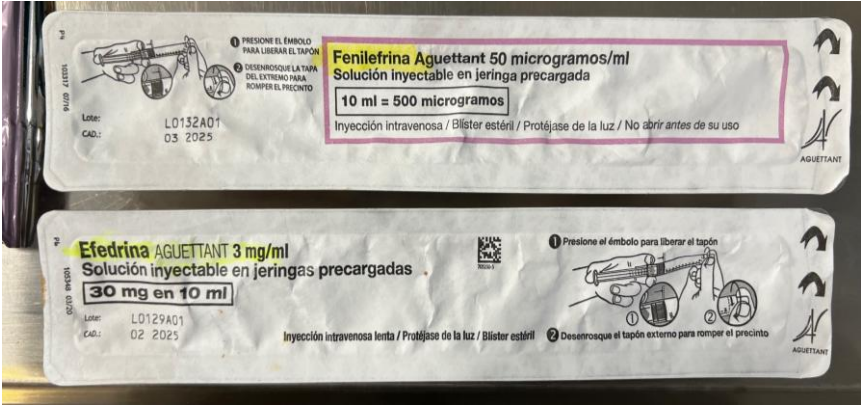
Type III open fractures  
Guidelines recommended  
ATB

74% with pharmacist vs  
29% without pharmacist  
p<0.01

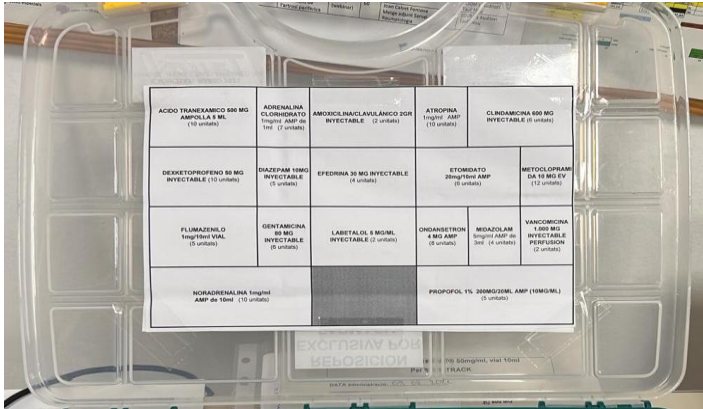
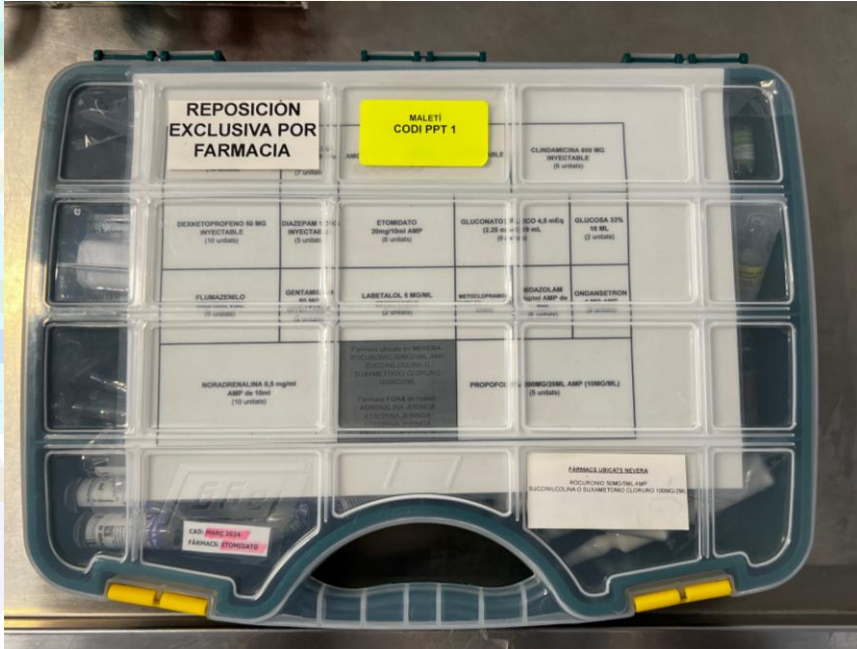
Harvey S, et al, 2018. Impact of an emergency medicine pharmacist on initial antibiotic prophylaxis for open fractures in trauma patients. *Am J Emerg Med.*;36(2):290-293. 29. Lack, WD., et al, 2015. Type III open tibia fractures: immediate antibiotic prophylaxis minimizes infection. *Journal of orthopaedic trauma*, 29(1), 1-6.



## Cosas fáciles









# Para terminar...

## PRACTICE RESEARCH REPORT

### Pharmacist involvement in trauma resuscitation across the United States: A 10-year follow-up survey

Pharmacist involvement with trauma teams increased significantly from **23% in 2007** to **70% (77/110) in 2017**,  $p < 0.001$ .

**Reasons for not considering pharmacist involvement 21 trauma centers** staffing difficulties (7), no need/no value (6), lack of pharmacist training (2), and cost (2)

**8 respondents stated that they did not realize pharmacists could have a role in trauma resuscitation**

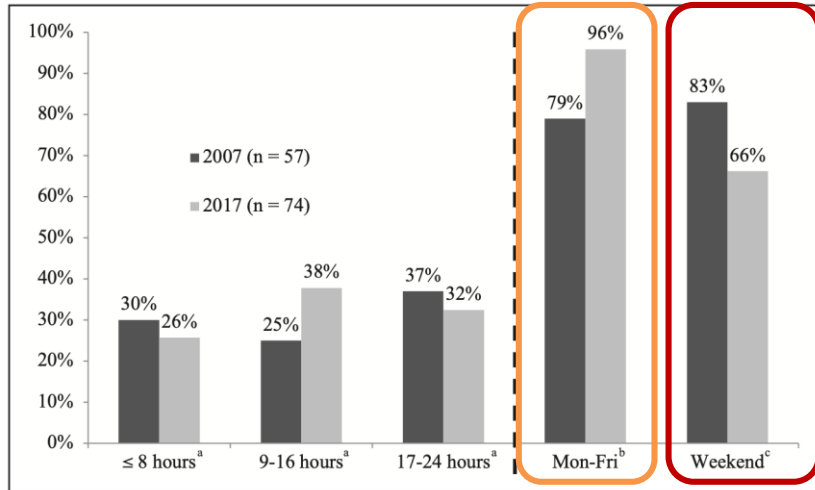


Table 1. Hospital Characteristics (n = 110)

Characteristic	No. (%)
Region	
Midwest	43 (39)
Northeast	29 (27)
Southwest	22 (20)
Northwest	10 (9)
Southeast	6 (5.5)
Institution	
Academic medical center	70 (64)
Community hospital	40 (36)
Trauma designation*	
Adult	
Level I	53 (48)
Level II	35 (32)
Level III	11 (10)
Pediatric	
Level I	18 (16)
Level II	19 (17)
Emergency department annual volume	
<40,000	16 (15)
40,000–59,999	17 (16)
60,000–79,999	26 (24)
80,000–99,999	20 (18)
100,000–119,999	16 (15)
≥120,000	15 (14)

\*Respondents were allowed to select multiple answers

**Figure 1.** Trauma resuscitation pharmacist coverage. <sup>a</sup>≤ 8 hours,  $p = 0.6$ ; 9-16 hours,  $p = 0.11$ ; 17-24 hours,  $p = 0.6$ : <sup>b</sup> $p = 0.003$ ; <sup>c</sup> $p = 0.037$ .



**Table 2.** Pharmacist Services Provided During Trauma Resuscitation

Service	2007 (n = 57)	2017 (n = 73)	p
Calculate doses	52 (91)	70 (96)	0.27
Medication information	51 (90)	58 (80)	0.12
Medication preparation	49 (86)	65 (89)	0.6
Medication compatibility recommendations	46 (81)	57 (78)	0.71
Proactive recommendations	39 (68)	48 (66)	0.75
Quick access to controlled medications	37 (65)	48 (66)	0.93
Medications to remote areas	22 (39)	26 (36)	0.73
Ensure documentation	9 (16)	20 (27)	0.11
Ensure billing	6 (11)	6 (8)	0.65

<sup>a</sup>Respondents were allowed to select multiple answers. All data are number and percentage of respondents.

**Table 3.** Pharmacist Services Provided to the Trauma Program/  
Administrative Aspects

<b>Trauma Program Service Provided<sup>a</sup> (n = 50)</b>	<b>No. (%)</b>
Trauma team education	44 (88)
Pharmacy operations <sup>b</sup>	42 (84)
Medication safety	41 (82)
Quality improvement data collection	40 (80)
Review of quality assurance cases	27 (54)
Interdisciplinary research	27 (54)
Interdisciplinary scholarly activity	25 (50)
Accreditation preparation	20 (40)
Trauma simulation participation	11 (22)
Community outreach	2 (4)

<sup>a</sup>Respondents were allowed to select multiple answers.

<sup>b</sup>Automated dispensing cabinet optimization, improvements in drug compounding efficiencies, medication delivery to ensure timely administration, etc.

Pharmacist involvement on trauma teams was “valuable” or “extremely valuable”

**Current pharmacist involvement 97% (75/77)**

**Respondents without pharmacist involvement, but who were considering it for the future 75%**

**Not considering it 24%**

“Pharmacists are increasingly important members of the trauma team, as evidenced by significant growth from 2007 to 2017”

“In addition to the **clinical benefit at the bedside**, pharmacists can support the **regular activities of a trauma program** in many meaningful ways”

## Recomendaciones

ESTUDIAR

ESTUDIAR

ESTUDIAR

RODEARSE DE GENTE CON ILUSIÓN Y QUE LE GUSTE SU TRABAJO

Os doy una pista: siempre sonrén :D

Lo demás viene solo...





# ¿ A qué esperamos?



A CORUÑA  
17-19 OCT 24

# ¡Gracias a todos!

Javier Ramos Rodríguez

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Servicio de Farmacia

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## CONGRESO NACIONAL

SOCIEDAD ESPAÑOLA DE  
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