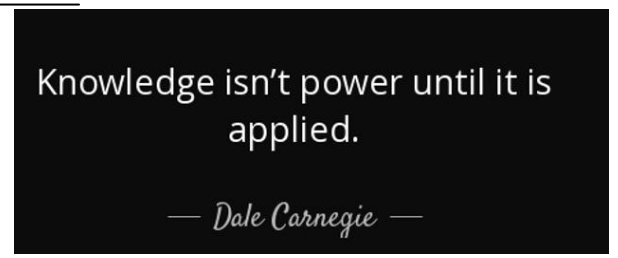
AI trong hỗ trợ xử trí hợp lý nhiễm khuẩn sơ sinh sớm trong điều kiện Việt Nam.

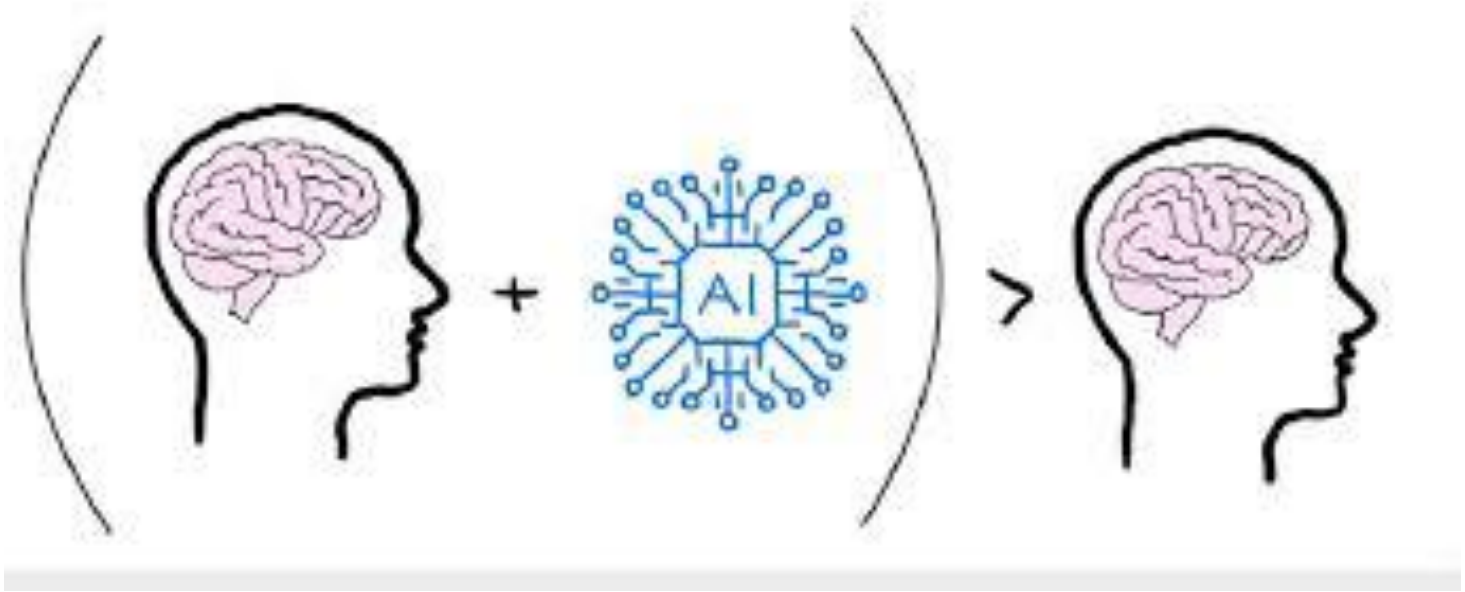
PAST	PRESENT	FUTURE
Intuition Medicine	Evidence-based Medicine	Precision Medicine
Signs and Symptoms	Clinical Trials	Algorithms

PGS. Nguyễn Thu Tịnh
Bộ môn Nhi
Đại học Y Dược Thành phố Hồ Chí Minh
✆ 0903110277 ✉ tinhnguyen@ump.edu.vn



DIKW Pyramid

“The healthcare system with AI will be better than the healthcare system without it.”



Johnson KB, et al. Precision Medicine, AI, and the Future of Personalized Health Care. Clin Transl Sci. 2021 Jan;14(1):86-93. doi: 10.1111/cts.12884.

“AI will not replace doctors. But doctors who use AI will replace doctors who don’t.”

Jesse Ehrenfeld

Add languages

Article Talk | Read Edit View history Tools

From Wikipedia, the free encyclopedia

Jesse Menachem Ehrenfeld (born 1978) is an American physician. Ehrenfeld is President of the American Medical Association, since June 2023,[1][2] and Professor of Anesthesiology at the Medical College of Wisconsin. He is also a former Speaker of the Massachusetts Medical Society,[3] where he was the youngest officer in the 228-year history of the organization. He is also a former Vice-President of the Massachusetts Society of Anesthesiologists.[4]

The inaugural recipient on the NIH Sexual and Gender Minority Research Award from the NIH Director,[5] Ehrenfeld has been recognized for his contributions to advancing health equity. A 2008 recipient of the AMA Foundation Leadership Award,[6] Ehrenfeld is a researcher in the field of biomedical informatics. Ehrenfeld's research interests include bioinformatics and the application of information technology to increase quality, reliability and patient safety.

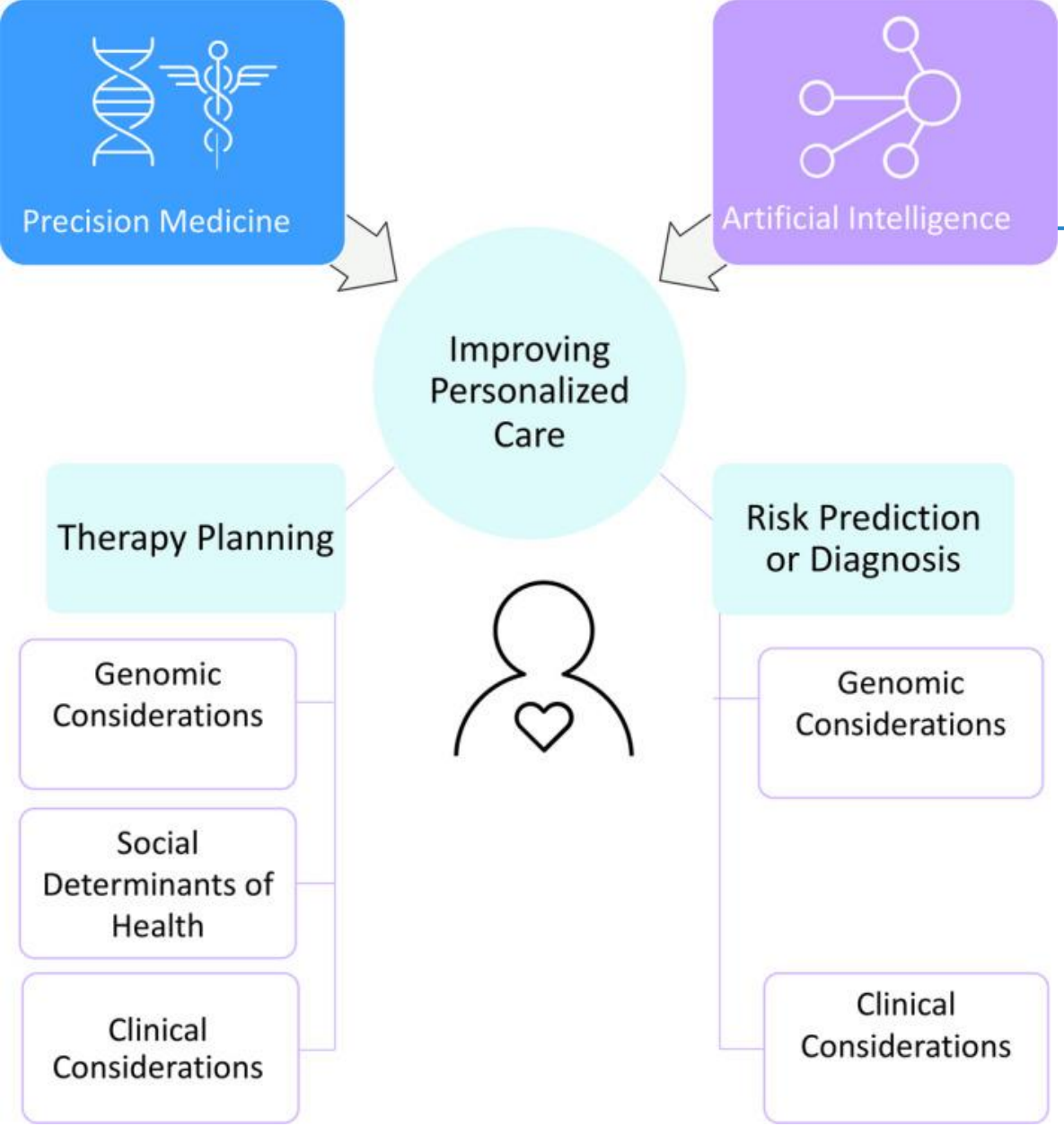
Ehrenfeld's work has led to the presentation of over 200 abstracts at national/international meetings and the publication of over 175 manuscripts in peer-reviewed journals. He serves as Editor-in-Chief of the Journal of Medical Systems,[7] and is a fellow of the American Medical Informatics Association[8] and the American Society of Anesthesiologists.[9]

Education [edit]

Jesse Ehrenfeld

Ehrenfeld at SXSW 2024

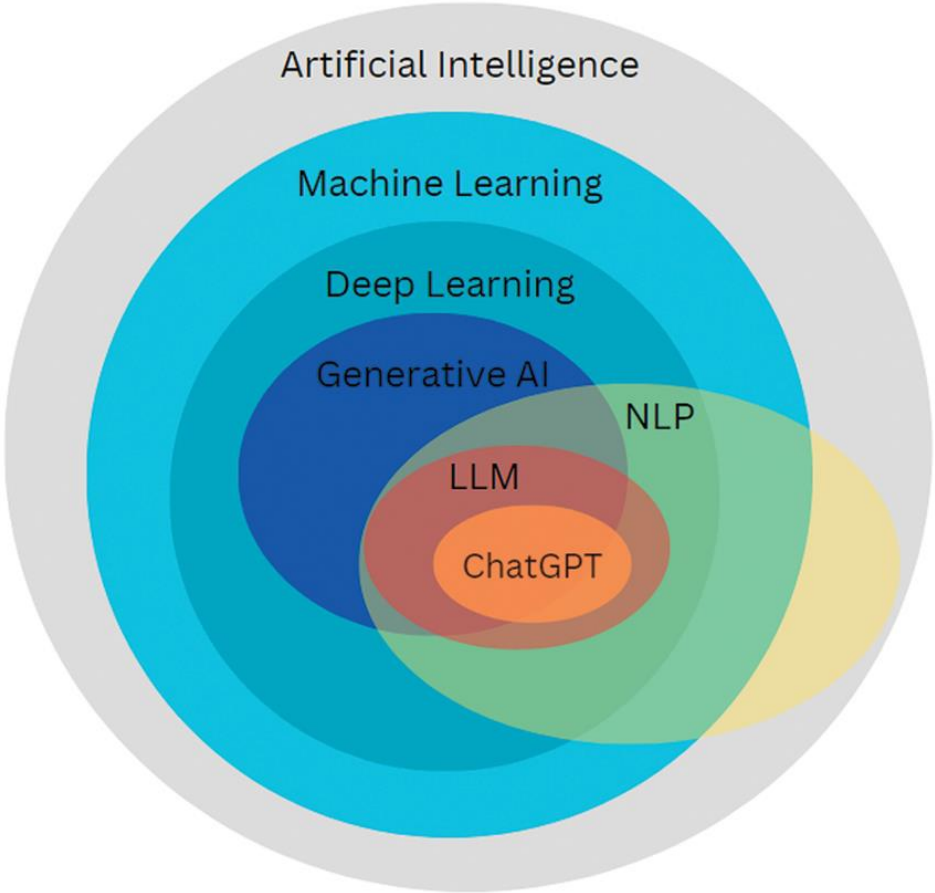
Born	1978 (age 46–47) Wilmington, Delaware, U.S.
Education	Haverford College (BS) University of Chicago (MD) Harvard University (MPH)



PAST	PRESENT	FUTURE
Intuition Medicine	Evidence-based Medicine	Precision Medicine
Signs and Symptoms	Clinical Trials	Algorithms

Johnson KB, et al. Precision Medicine, AI, and the Future of Personalized Health Care. Clin Transl Sci. 2021 Jan;14(1):86-93. doi: 10.1111/cts.12884.

AI và phân loại AI theo khả năng



Alomari, E.A. (2024). *Computer Modeling in Engineering & Sciences*, *141(1)*, 43–85. https://doi.org/10.32604/cmes.2024.052256

Nội dung trình bày

- Tầm quan trọng của NKSSS
- Một số hướng dẫn xử trí NKSSS
- CDSS trong hỗ trợ xử trí NKSSS

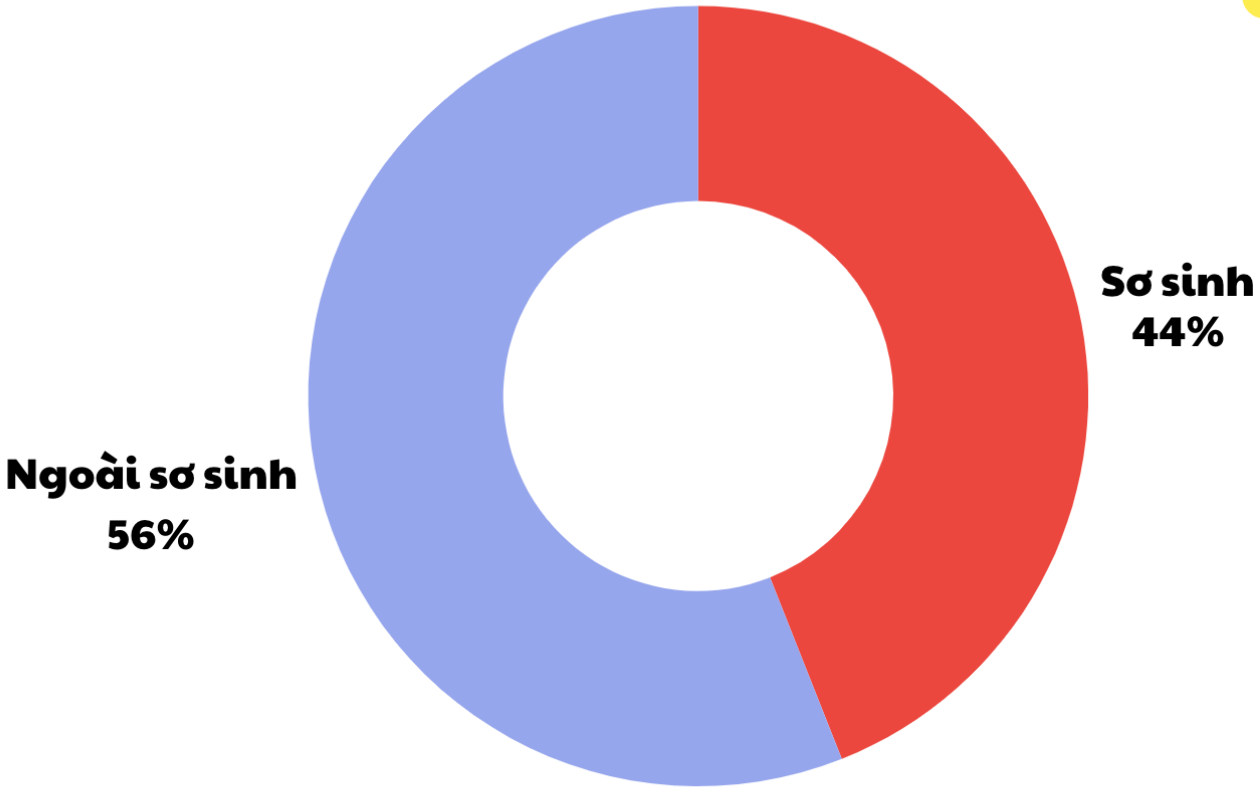
Tử vong sơ sinh Việt Nam

UN Inter-agency Group for Child Mortality Estimation

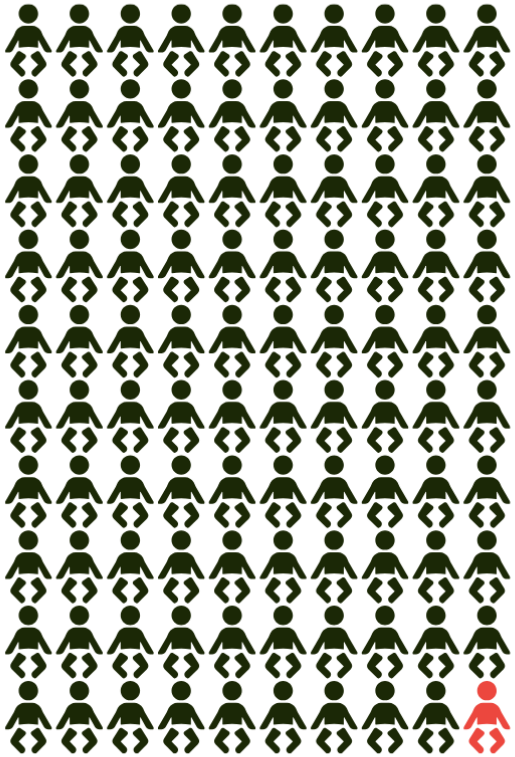
2023: ~ 10/1000

https://childmortality.org/all-cause-mortality/data?indicator=MRM0&refArea=VNM

TÌNH HÌNH TỬ VONG SƠ SINH



Thế giới: 2,3 triệu / năm



Việt Nam ~ 1%

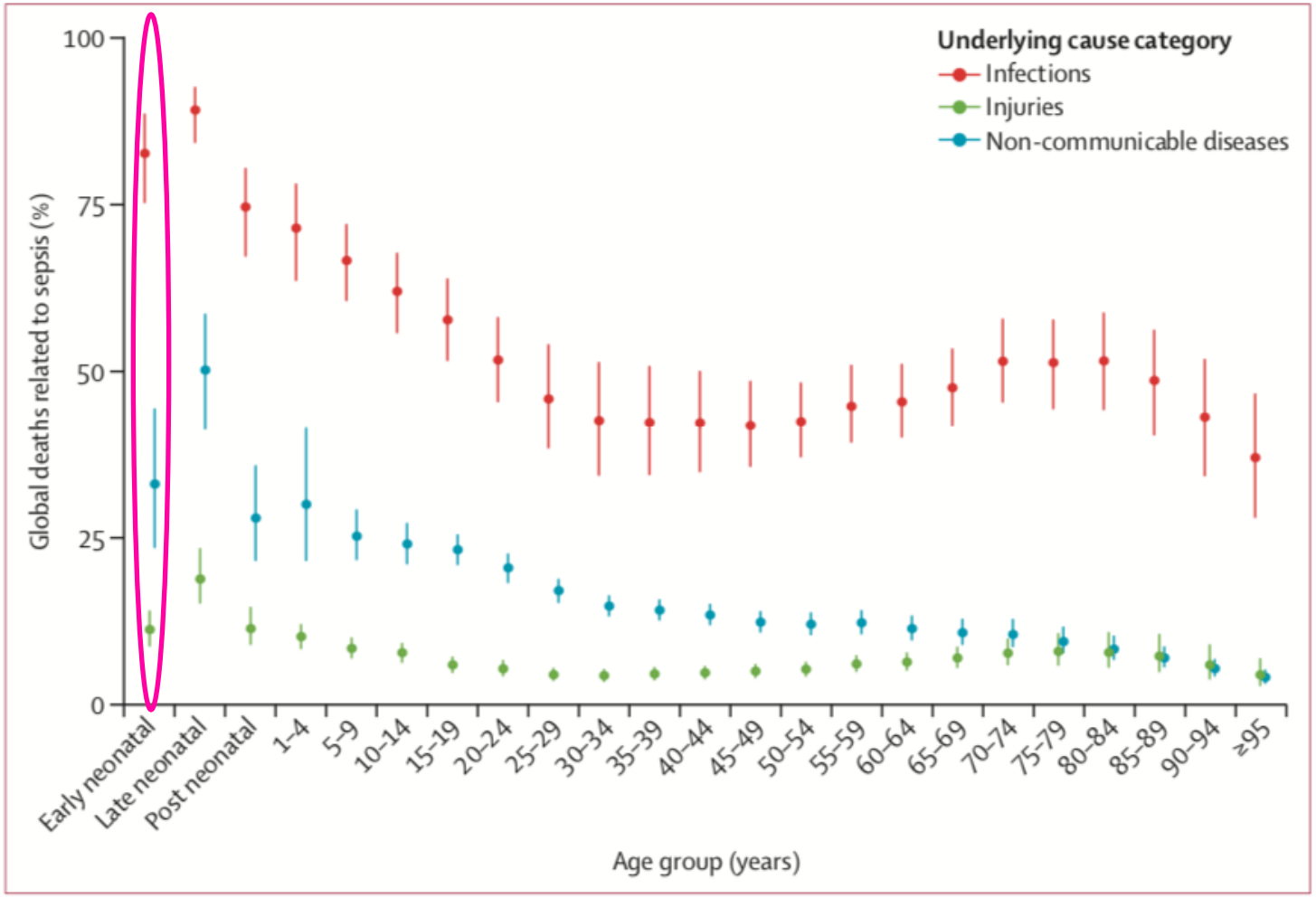
Thế giới

https://www.who.int/news-room/fact-sheets/detail/newborn-mortality

Liu L. et al. The Lancet 2016. 388: p3027 - 3035

Gánh nặng toàn cầu của nhiễm khuẩn huyết
(Global Burden of Disease – GBD 1990-2017)

- Cao ở trẻ sơ sinh và người lớn tuổi
- Năm 2017: 2,9 triệu trẻ < 5 tuổi tử vong liên quan NKH.
- Tử vong cao (5-50%)



Rudd K.E. Et al. Lancet, Vol 395 January 18, 2020

Tỷ lệ mắc NKHSS sớm

Châu lục	Quốc gia	Tỷ lệ /1000 trẻ sinh sống	Cấy máu dương	TLTK
Africa	7 quốc gia Châu Phi	21	-	Seale et al 2009
	South Africa	39,3	3,2	Velaphi S et al 2019
	Middle-high income	0,6-15,7		Khalil N et al 2020
South Asia	Bangladesh	76,8	-	Chan GJ et al 2013
	India	24	-	Sundaram V et al 2008
	Bhutan	54,5	19	jasho J et al 2020
South America	Brazil	4	0,31	Camago JF et al 2021
	Suriname	1,37	-	Achten NB et al 2021

US: 0,5-1/1000 (Polin 2021, Schrag et al, 2016, Bizzarro et al, 2015)

Việt Nam: ~ 16-21/1000.

Các "bất định" của NKSSS sớm

- Định nghĩa NKSSS: ≠ RLCN cơ quan ở trẻ em / người lớn.
  - Cấy máu ("definite", "culture-proven")
  - Xét nghiệm ("probable", "clinical")
  - Lâm sàng / YTNC ("possible")
- "Sớm": ≤ 48h, ≤ 72h, ≤ 5 ngày, ≤ 7 ngày?.
- Không đồng nhất: đủ tháng ≠ non tháng.
- Tỷ lệ mắc, tác nhân, tử vong LMICs khác HICs.

FROM THE AMERICAN ACADEMY OF PEDIATRICS | CLINICAL REPORT | DECEMBER 01 2018

Management of Neonates Born at ≥35 0/7 Weeks' Gestation With Suspected or Proven Early-Onset Bacterial Sepsis FREE

Karen M. Puopolo, MD ✉; William E. Benitz, MD; Theoklis E. Zaoutis, MD; COMMITTEE ON FETUS AND NEWBORN; COMMITTEE ON INFECTIOUS DISEASES; James Cummings, MD; Sandra Juul, MD; Ivan Hand, MD; Eric Eichenwald, MD; Brenda Poindexter, MD; Dan L. Stewart, MD; Susan W. Aucott, MD; Jay P. Goldsmith, MD; Kristi Watterberg, MD; Carrie L. Byington, MD; Yvonne A. Maldonado, MD; Ritu Banerjee, MD; Elizabeth D. Barnett, MD; James D. Campbell, MD; Jeffrey S. Gerber, MD; Ruth Lynfield, MD; Flor M. Munoz, MD; Dawn Nolt, MD; Ann-Christine Nyquist, MD; Sean T. O'Leary, MD; Mobeen H. Rathore, MD; Mark H. Sawyer, MD; William J. Steinbach, MD; Tina Q. Tan, MD

Address correspondence to Karen M. Puopolo, MD, PhD, FAAP. E-mail: puopolok@email.chop.edu

KAISER PERMANENTE® | DIVISION OF RESEARCH

Neonatal Early-Onset Sepsis Calculator (2024 Update)

Updated EOS Calculator 2024 | Classification | References | FAQ | Original EOS calculator

Probability of Neonatal Early-Onset Sepsis Based on Maternal Risk Factors and the Infant's Clinical Presentation

The tool below is intended for the use of clinicians trained and experienced in the care of newborn infants. Using this tool, the risk of early-onset sepsis can be calculated in an infant born ≥ 35 weeks gestation. The interactive calculator produces the probability of early onset sepsis per 1000 babies by entering values for the specified maternal risk factors along with the infant's clinical presentation.

NICE National Institute for Health and Care Excellence

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Guidance | Standards and indicators | Clinical Knowledge Summaries (CKS) | British National Formulary (BNF) | British National Formulary for Children (BNFC) | Life sciences

Home > NICE Guidance > Conditions and diseases > Infections > Antimicrobial stewardship

Neonatal infection: antibiotics for prevention and treatment

NICE guideline | NG195 | Published: 20 April 2021 | Last updated: 19 March 2024

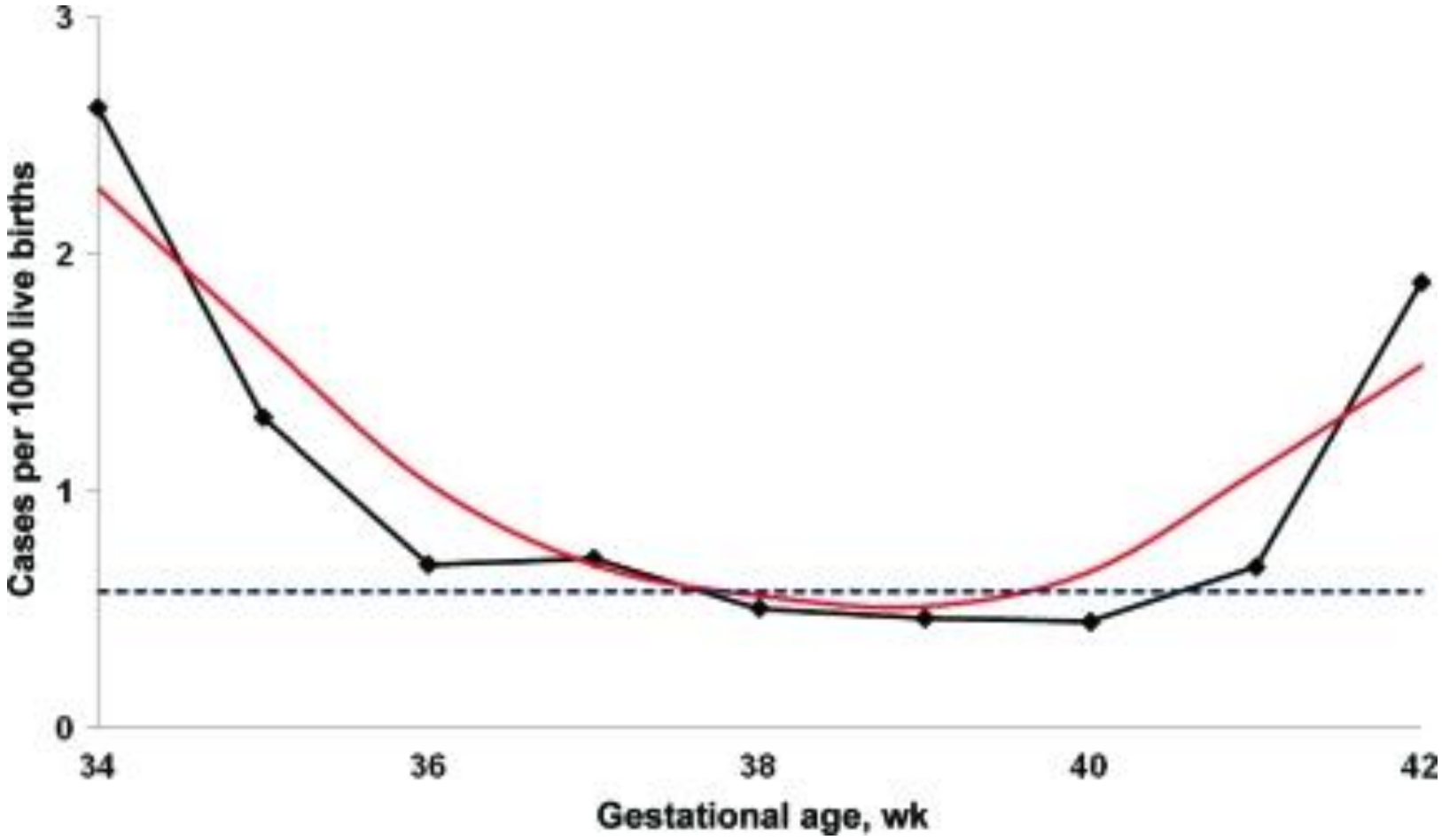
On this page

Kaiser NEOS Calculator

- Retrospective nested case control, trẻ ≥ 34 tuần.
- Case NKSS sớm ≤ 72 giờ, n=350; control n=1063
- Các YTNC dưới dạng biến liên tục
- 1/3 trẻ cấy máu dương: không triệu chứng ≤ 12 giờ sau sinh.

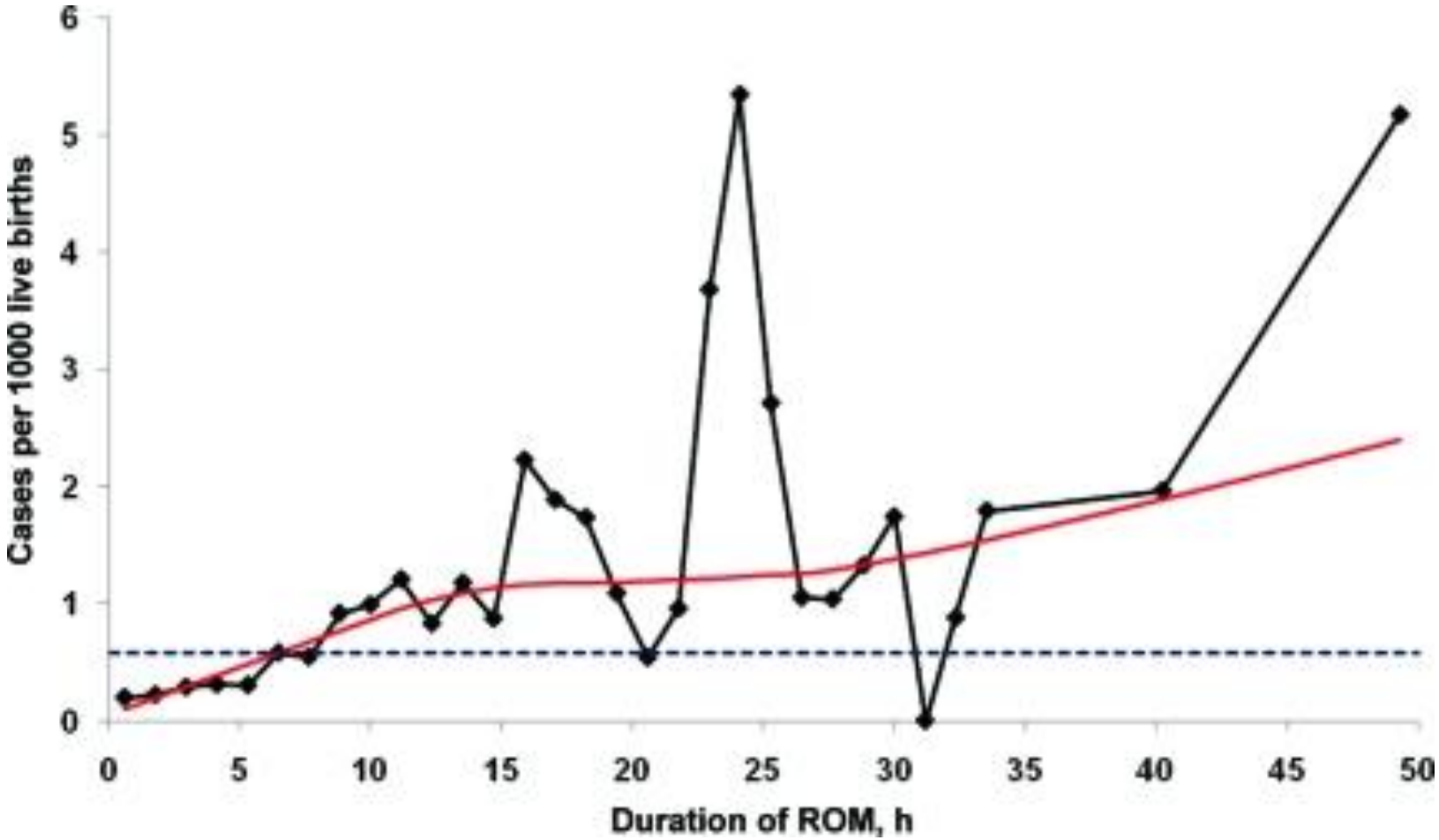
XS tiền nghiệm (YTNC) → XS hậu nghiệm (TCLS 6-12h sau sinh)

Tuổi thai và NKSSS sớm



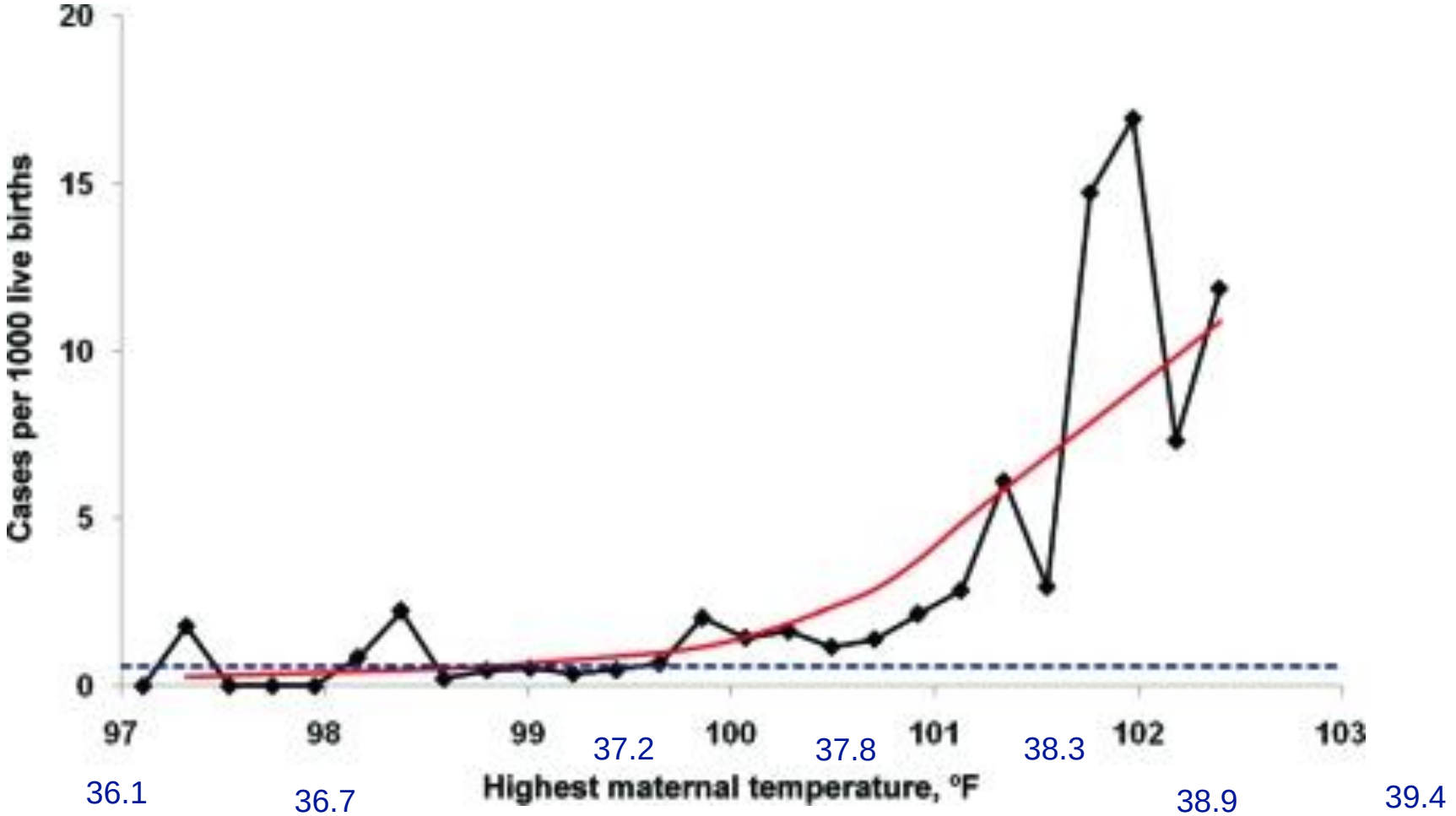
Puopolo PM et al. Pediatrics. 2011 Nov; 128(5): e1155–e1163.

Thời gian ối vỡ và NKSSS sớm



Puopolo PM et al. Pediatrics. 2011 Nov; 128(5): e1155–e1163.

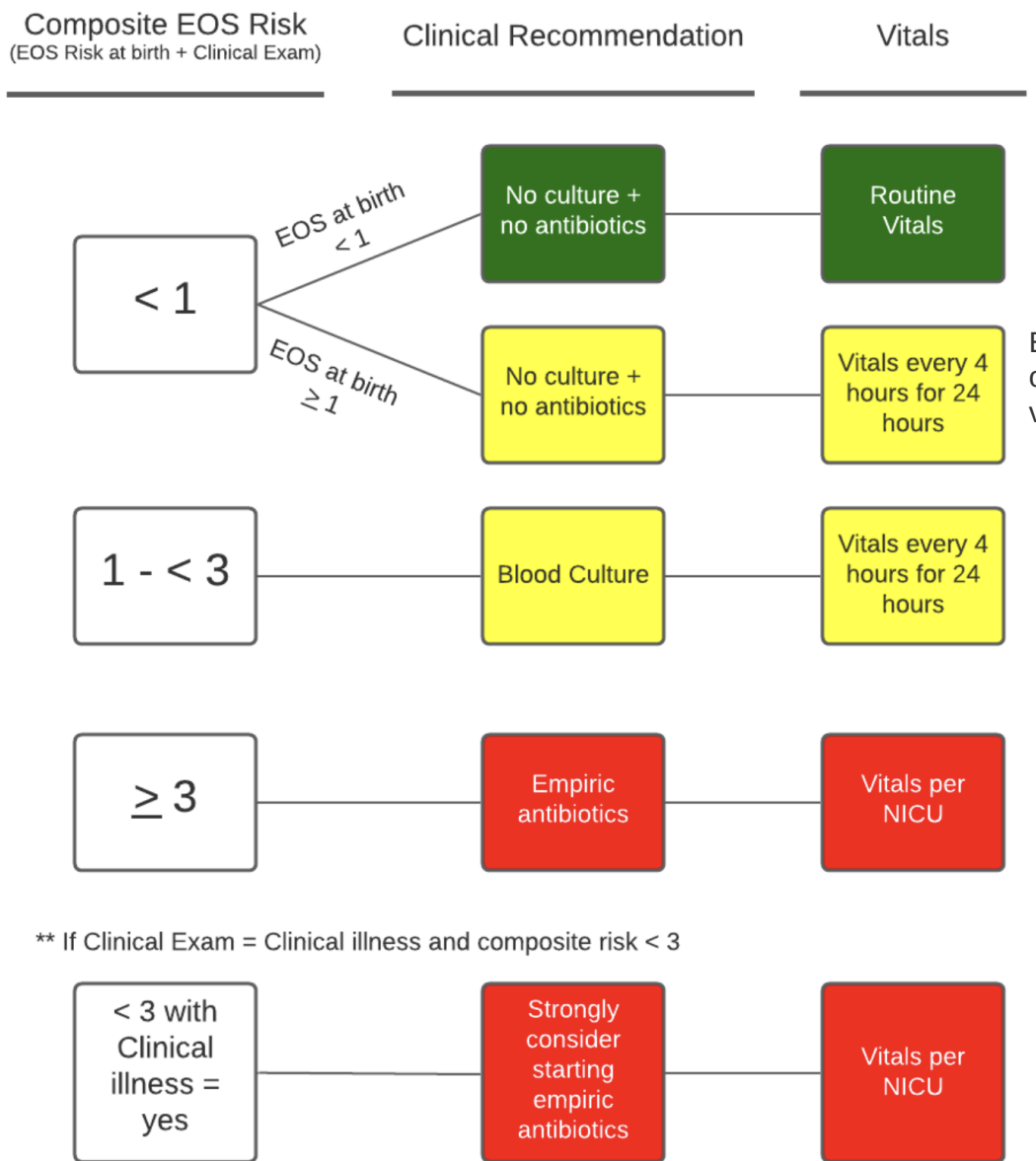
Thân nhiệt cao nhất của mẹ trong chuyển dạ



Xác suất NKSSS sớm theo YTNC của mẹ

Predictor[a]	Data Set, %		
	Derivation	Validation	Entire
Gestational age	10.7	26.5	16.7
GBS status	2.0	3.2	2.3
ROM time	14.8	9.3	12.6
Highest intrapartum temperature	62.5	50.1	58.4
Intrapartum antibiotics treatment	10.0	10.9	10.0

Kaiser NEOS Calculator



Enhanced observation (q 4 hour vitals for 24 hours

Probability of EOS based on Maternal Risk Factors	
Maternal Predictor	**Enter Clinical Values:**
Gestational age (e.g. 40 3/7)	40 6/7
Temperature F	98,6
ROM(hrs)	8
Maternal GBS Status	● NEGATIVE ○ POSITIVE ○ UNKNOWN
Type of intrapartum antibiotics	○ Broad Abx ≥ 4hrs ● Broad Abx 2-3.9hrs ○ GBS Specific Abx ≥2hrs ○ No Abx; Any Abx <2hrs

Variable	*Betas*	*Values*
Intercept	40,74890	40,74890
GA	-6,93250	-283,2421
GA2	0,0877	146,3981
Temp_max	0,86800	85,5848
ROM	1,22560	1,8600
GBS (+)	0,57710	0
GBS UNK	0,04270	0
Broad ≥4	-1,18610	0
Broad 2-3.9	-1,04880	-1,0488
GBS specific ≥2	-1,04880	0
	Sum of Betas	-9,69912
	EOS risk @ Birth	0,00006

Maternal Risk factors	*EOS risk per 1000/births*	*Clinical Recommendation*
EOS Risk @ Birth	**0,06**	**Routine Vitals**
Clinical Exam		
Well Appearing	**0,03**	**No additional care**
Equivocal	**0,31**	**No additional care**
Clinical Illness	**1,30**	**Blood culture and vitals every 4 hours for 16 hours**

	Pre. Probability (P)	Likelihood Ratios (UL 95% CI)	Odds	Post. (P)	Per 1000
EOS risk @ birth	0,00006	n/a	6,13376E-05	n/a	0,06
Well Appearing	n/a	0,41	2,51484E-05	2,51478E-05	0,03
Equivocal	n/a	5	0,000306688	0,000306594	0,31
Clinical Illness	n/a	21,2	0,001300357	0,001298669	1,30

Xác xuất dự đoán (/1000 trẻ sinh sống) = …

https://neonatalsepsiscalculator.kaiserpermanente.org/EmrFAQ.aspx

Tình huống lâm sàng

Bé trai, 1 giờ tuổi, con 1/1, 39 tuần, ối vỡ 18 giờ, sinh thường, APGAR $1^{8}5^{9}$. GBS (-), được điều trị với Amipicilline ~ 2,5 giờ trước sinh do mẹ sốt $38,5^{0}C$. Sau sinh bé ổn định, được hồi sức thường quy.

Khám: CN 3200g, thở 80 l/p, tim 164 l/p, phập phồng cánh mũi, co lõm ngực và co kéo liên sườn nhẹ, phổi thông khí tốt, có tiếng thở rên thì thở ra không liên tục, SpO_2 97%. Bình thường về các mặt khác.

Xử trí trẻ này như thế nào là phù hợp nhất?

A. Nằm với mẹ, chăm sóc thường quy.

B. T/d hô hấp tại dưỡng nhi trong 2-6 giờ.

C. Xét nghiệm huyết đồ, CRP.

D. Huyết đồ, CRP, cấy máu, cho kháng sinh.

Please enter details below.

Predictor	Scenario
Calculator Version	Original (2017) - No Universal GBS Screening Updated (2024) - Universal GBS Screening
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC national incidence)
Gestational age	38 weeks 0 days
Highest maternal antepartum temperature	38.8 Celsius
ROM (Hours)	10
Maternal GBS status	Negative Positive Unknown
Type of intrapartum antibiotics	Broad spectrum antibiotics > 4 hrs prior to birth Broad spectrum antibiotics 2-3.9 hrs prior to birth GBS specific antibiotics > 2 hrs prior to birth No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births	
EOS Risk @ Birth	1.01

EOS Risk after Clinical Exam	Risk per 1000/ births	Clinical Recommendation	Vitals
Well Appearing	0.42	No culture, no antibiotics	Vitals every 4 hours for 24 hours
Equivocal	5.04	Empiric antibiotics	Vitals per NICU
Clinical Illness	21.02	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation Clinical Illness Equivocal Well Appearing

Original EOS Calculator 2017 version

Predictor	Scenario
Calculator Version	Original (2017) - No Universal GBS Screening Updated (2024) - Universal GBS Screening
Incidence of Early-Onset Sepsis	0.50/1000 live births (CDC national incidence)
Gestational age	38 weeks 0 days
Highest maternal antepartum temperature	38.8 Celsius
ROM (Hours)	10
Maternal GBS status	Negative Positive Unknown
Type of intrapartum antibiotics	Broad spectrum antibiotics > 4 hrs prior to birth Broad spectrum antibiotics 2-3.9 hrs prior to birth GBS specific antibiotics > 2 hrs prior to birth No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births	
EOS Risk @ Birth	1.80

EOS Risk after Clinical Exam	Risk per 1000/ births	Clinical Recommendation	Vitals
Well Appearing	0.65	No culture, no antibiotics	Vitals every 4 hours for 24 hours
Equivocal	6.53	Empiric antibiotics	Vitals per NICU
Clinical Illness	25.45	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation Clinical Illness Equivocal Well Appearing

Original EOS Calculator 2017 version

0,5/1000

Kết quả

Risk per 1000/births	
EOS Risk @ Birth	1.01

EOS Risk after Clinical Exam	Risk per 1000/births	Khuyến Nghị
Khoẻ (Well Appearing)	0.42	Chăm sóc thường qui
Nghi ngờ (Equivocal)	5.04	Kháng sinh
Bệnh (Clinical Illness)	21.03	Kháng sinh

Predictor	Scenario
Calculator Version	Original (2017) - No Universal GBS Screening Updated (2024) - Universal GBS Screening
Incidence of Early-Onset Sepsis	5.00/1000 live births
Gestational age	39 weeks 0 days
Highest maternal antepartum temperature	38.5 Celsius
ROM (Hours)	18
Maternal GBS status	Negative Positive Unknown
Type of intrapartum antibiotics	Broad spectrum antibiotics > 4 hrs prior to birth Broad spectrum antibiotics 2-3.9 hrs prior to birth GBS specific antibiotics > 2 hrs prior to birth No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births	
EOS Risk @ Birth	3.54

EOS Risk after Clinical Exam	Risk per 1000/ births	Clinical Recommendation	Vitals
Well Appearing	1.28	Blood culture	Vitals every 4 hours for 24 hours
Equivocal	12.79	Empiric antibiotics	Vitals per NICU
Clinical Illness	48.96	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation Clinical Illness Equivocal Well Appearing

Original EOS Calculator 2017 version

Predictor	Scenario
Calculator Version	Original (2017) - No Universal GBS Screening Updated (2024) - Universal GBS Screening
Incidence of Early-Onset Sepsis	4/1000 live births
Gestational age	39 weeks 0 days
Highest maternal antepartum temperature	38.5 Celsius
ROM (Hours)	18
Maternal GBS status	Negative Positive Unknown
Type of intrapartum antibiotics	Broad spectrum antibiotics > 4 hrs prior to birth Broad spectrum antibiotics 2-3.9 hrs prior to birth GBS specific antibiotics > 2 hrs prior to birth No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births	
EOS Risk @ Birth	5.31

EOS Risk after Clinical Exam	Risk per 1000/ births	Clinical Recommendation	Vitals
Well Appearing	2.18	Blood culture	Vitals every 4 hours for 24 hours
Equivocal	25.99	Empiric antibiotics	Vitals per NICU
Clinical Illness	101.63	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation Clinical Illness Equivocal Well Appearing

Original EOS Calculator 2017 version

17/1000

Risk per 1000/births	
EOS Risk @ Birth	21.87

EOS Risk after Clinical Exam	Risk per 1000/births	Khuyến Nghị
Khoẻ (Well Appearing)	9.08	Kháng sinh
Nghi ngờ (Equivocal)	100.53	Kháng sinh
Bệnh (Clinical Illness)	321.53	Kháng sinh

Kết luận

- NKSSS: thách thức trong chẩn đoán.
- Chiến lược phù hợp tại chỗ: giảm KS không cần thiết + không bỏ sót ca nặng.
- CDSS chọn lựa phù hợp tiếp cận EOS.
- AI: hứa hẹn, mô hình AI thích hợp.

Cám ơn
sự theo dõi của quý đồng nghiệp