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# Fellow's Column:Spontaneous Intestinal Perforation or Necrotizing Enterocolitis

*Kristie Searcy, MD, Shabih Manzar, MD*

***Summary:***

*Confusion and overlap exist with the definition of necrotizing enterocolitis (NEC) and spontaneous intestinal perforation (SIP). Although clinically significant NEC and SIP may present similarly, the confirmation requires exploratory laparotomy. The article describes a working algorithm to differentiate between the SIP and NEC. This draft aims to stimulate the neonatology practicing community about this topic. Further discussion is needed to reach some consensus.*

***Abbreviations:***

*SIP/FIP- Spontaneous/Focal Intestinal Perforation, NEC- Necrotizing Enterocolitis*

***"The article describes a working algorithm to differentiate between the SIP and NEC. This draft aims to stimulate the neonatology practicing community about this topic. Further discussion is needed to reach some consensus."***

**Cost:**

The estimated annual cost of caring for infants with Necrotizing Enterocolitis (NEC) is about $500 million to $1 billion. [1] NEC is used as one of the NICU's key performance indicators. (2,3) A high-performer institution is the one that has the lowest incidence of NEC. However, the data could be influenced by how the institution defines NEC.

***"Recently, Nue (4) questioned Bell's criteria for diagnosing NEC, which was developed in the late 1970s. The author believed this staging system is outdated and suggested using the terms' medical NEC' or 'surgical NEC' depending on the clinical symptoms, radiologic signs, and surgical findings."***

**Controversy:**

Recently, Nue (4) questioned Bell's criteria for diagnosing NEC, which was developed in the late 1970s. The author believed this staging system is outdated and suggested using the terms' medical NEC' or 'surgical NEC' depending on the clinical symptoms, radiologic signs, and surgical findings. Similarly, Berrington and Embleton (5) expressed concerns about differentiating NEC with focal intestinal perforation (FIP). Swanson et al. (6) reported the published data from a US national data set from 2002 to 2017, showing a decreasing trend in NEC while an increasing trend of spontaneous intestinal perforation (SIP). They also encountered and acknowledged the overlap and misdiagnosis between the two. In a Canadian study, Shah et al. (7) studied a cohort study of 17,426 infants and found higher odds of a composite outcome of mortality or morbidity with NEC than with SIP. In their report, the diagnosis of FIP/SIP was made according to the local practices based on the lack of clinical features of NEC. Studies from Fisher et al. (8) showed that neonates with laparotomy-confirmed SIP had significantly lower mortality than those with laparotomy-confirmed NEC.

So, this brings us to two questions: Why do we use NEC as a quality indicator if we cannot define it unanimously? Second, should we redefine NEC?

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**Diagnostic issues:**

Diagnostic-related groups (DRGs) have been used to measure the complexity of inpatients using a case mix index (CMI). (9 )Defining diseases is challenging in neonatal medicine. For example, hyaline membrane disease is also labeled as respiratory distress syndrome. One is a pathological diagnosis, while the other is a clinical one. To diagnose diseases, clinicians rely on clinical presentation supported by radiological, laboratory, and pathological findings. A retrospective case-control study of 114 infants where 48 infants had SPI and 66 had NEC showed that a transient increase in serum alkaline phosphatase level is independently associated with SIP compared to NEC, suggesting utility in using serum alkaline phosphatase levels to differential infants with these conditions. (10)

Labeling a condition with a diagnosis is required for management, data monitoring, and billing. NEC impacts the neurodevelopmental outcome and may persist long term; therefore, data on NEC is essential. For instance, studies suggest that preterm infants diagnosed with surgical NEC had slower catchup head growth at four months and were more likely to experience developmental delay at 36 months compared to preterm infants with surgical SIP. (11 ) The question is: why we do not create a single clinical diagnosis for conditions with similar clinical presentation. Once the clinician has all the data and evidence, the final diagnosis could be labeled as NEC, SIP/FIP.

***Proposed solution*:**

For example, high bilirubin is entered into the medical record as hyperbilirubinemia. Some clinicians prefer jaundice. Once the fractionated bilirubin information is available, the diagnosis

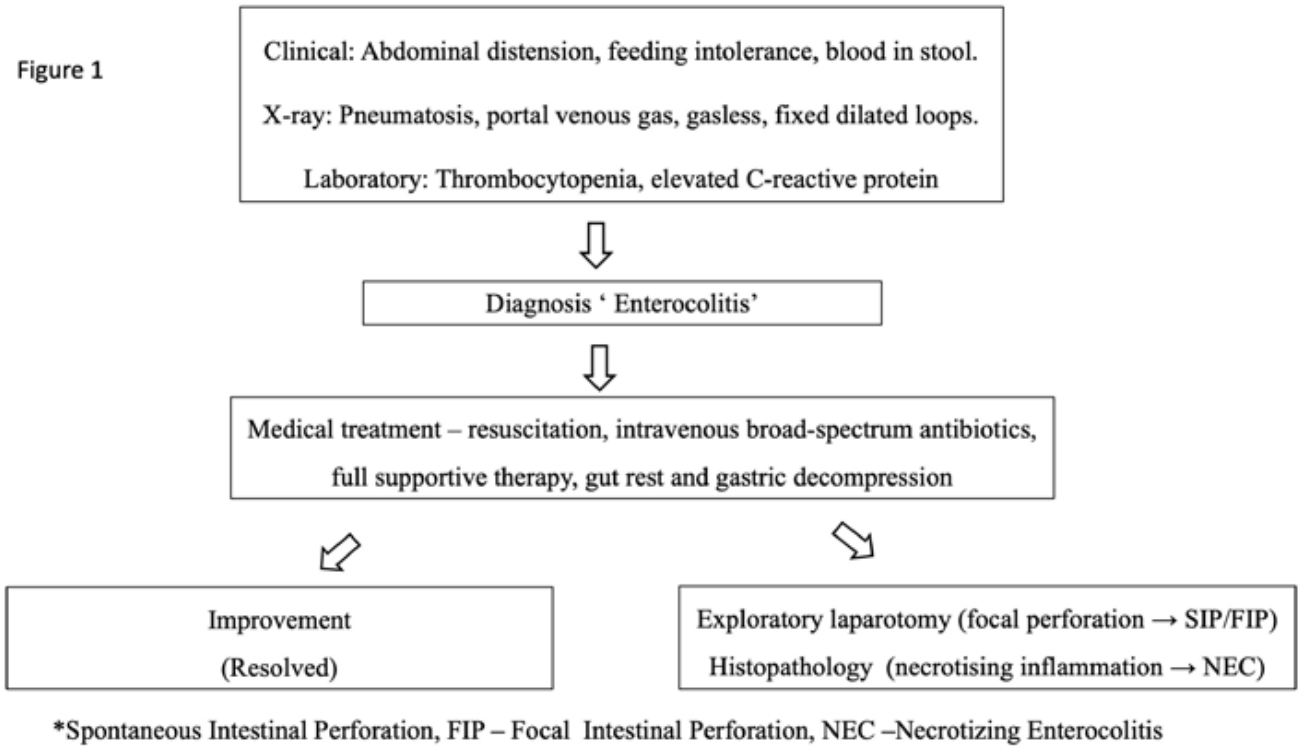


*Figure 1: The diagnostic flow chart for diagnosis of Enterocolitis to SIP/FIP-NEC*

is modified to unconjugated (indirect) or conjugated (direct) hyperbilirubinemia. Further, it could be classified as physiological or pathological jaundice. Using the same analogy, the name for a clinical presentation for SIP/FIP and NEC could be a common nomenclature.

To diagnose NEC or SIP/FIP, clinicians should look at clinical, ra-

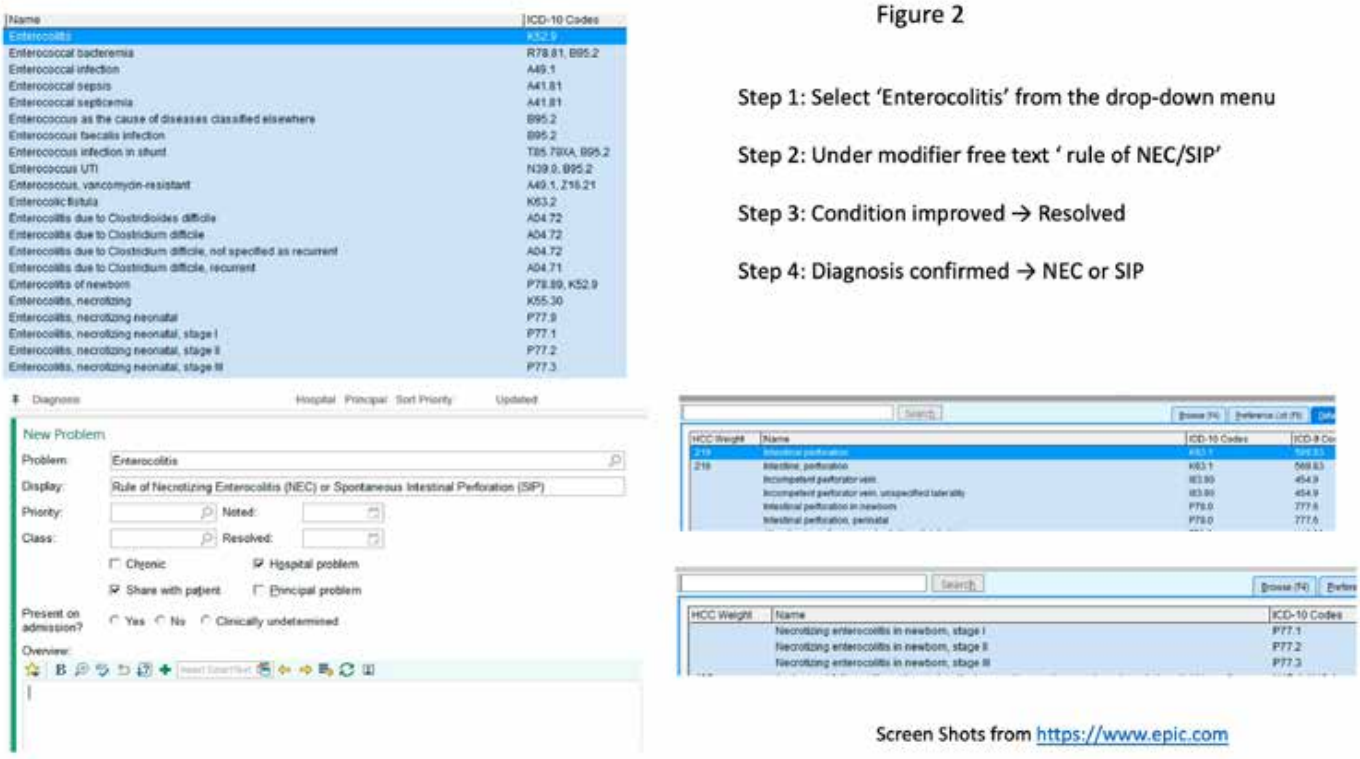


*Figure 2: Steps of working on the electronic chart with a diagnosis of Enterocolitis to SIP/FIP-NEC*

diological, and laboratory evidence (abdominal distension, feeding intolerance, blood in stool, pneumatosis, portal venous gas, gasless, fixed dilated loops, abnormal laboratory indices).

***"Based on this information, a diagnosis of 'enterocolitis' could be entertained as, at this point, SIP/NEC could not be ruled out. The caveat with the diagnosis of SIP/FIP and NEC is the need for exploratory laparotomy. Perforation can only be confirmed after surgical intervention, and necrotizing is a histopathological diagnosis. "***

Based on this information, a diagnosis of 'enterocolitis' could be entertained as, at this point, SIP/NEC could not be ruled out. The caveat with the diagnosis of SIP/FIP and NEC is the need for exploratory laparotomy. Perforation can only be confirmed after surgical intervention, and necrotizing is a histopathological diagnosis. Therefore, starting with a diagnosis of enterocolitis could be justified. Once confirmation is done, the final diagnosis could be changed to FIP or NEC (Figures 1 and 2). As the medical treatment for both conditions is the same (resuscitation, intravenous broad-spectrum antibiotics, full supportive therapy, gut rest, and gastric decompression), differentiating both at the time of occurrence is not that important.

This draft aims to stimulate the neonatology practicing community to get some consensus. Views and comments from colleagues would be appreciated.

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***References:***


1. *Lock JY, Carlson TL, Yu Y, Lu J, Claud EC, Carrier RL. Impact of Developmental Age, Necrotizing Enterocolitis Associated Stress, and Oral Therapeutic Intervention on Mucus Barrier Properties. Sci Rep. 2020;10(1):6692. Published 2020 Apr 21. doi:10.1038/s41598-020-63593-5*
2. *Edwards EM, Ehret DEY, Soll RF, Horbar JD. Vermont Oxford Network: a worldwide learning community. Transl Pediatr. 2019;8(3):182-192. doi:10.21037/tp.2019.07.01*
3. *https://ochsnerlg.org/services/pediatrics/nicu/nicu-key-performance-indicators*
4. *Neu J. Necrotizing Enterocolitis: The Future. Neonatology. 2020;117(2):240-244. doi:10.1159/000506866*
5. *Berrington J, Embleton ND. Discriminating necrotising enterocolitis and focal intestinal perforation. Arch Dis Child Fetal Neonatal Ed. 2022;107(3):336-339. doi:10.1136/archdischild-2020-321429*
6. *Swanson JR, Hair A, Clark RH, Gordon PV. Spontaneous intestinal perforation (SIP) will soon become the most common form of surgical bowel disease in the extremely low birth weight (ELBW) infant. J Perinatol. 2022;42(4):423-429. doi:10.1038/s41372-022-01347-z*
7. *Shah J, Singhal N, da Silva O, et al. Intestinal perforation in very preterm neonates: risk factors and outcomes. J Perinatol. 2015;35(8):595-600. doi:10.1038/jp.2015.41*
8. *Fisher JG, Jones BA, Gutierrez IM, et al. mortality associated with laparotomy-confirmed neonatal spontaneous intestinal perforation: a prospective 5-year multicenter analysis. J Pediatr Surg. 2014;49(8):1215-1219. doi:10.1016/j.jpedsurg.2013.11.051*
9. *Lin S, Rouse P, Zhang F, Wang YM. Measuring work complexity for acute care services. Int J Health Plann Manage. 2021;36(6):2199-2214. doi:10.1002/hpm.3279*
10. *Barseghyan K, Gayer C, Azhibekov T. Differences in Serum Alkaline Phosphatase Levels in Infants with Spontaneous Intestinal Perforation versus Necrotizing Enterocolitis with Perforation. Neonatology. 2020;117(3):349-357. doi:10.1159/000509617*
11. *Shin SH, Kim EK, Kim SH, Kim HY, Kim HS. Head Growth and Neurodevelopment of Preterm Infants with Surgical Necrotizing Enterocolitis and Spontaneous Intestinal Perforation. Children (Basel). 2021 Sep 23;8(10):833. doi: 10.3390/children8100833. PMID: 34682098; PMCID: PMC8534747.*



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*Kristie Searcy, MD*
*Internal Medicine-Pediatrics Resident, Department of Pediatrics*
*LSU Health Sciences Center*
*1501 Kings Highway*
*Shreveport, LA 71103*

*Corresponding Author*

*Shabih Manzar, MD*
*Clinical Associate Professor*
*LSU Health Sciences Center*
*1501 Kings Highway*
*Shreveport, LA 71103*
*Telephone: 318-626-1623*
*Fax: 318-675-6059*
*Email: shabih.manzar@lsuhs.edu*

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