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RESEARCH

INFECTIOUS DISEASE CONSULTATIONS IN HOSPITALIZED ELDERLY PATIENTS

ABSTRACT

Introduction: The aim of this study was to investigate the various features of infectious disease consultations, antibiotic usage before and after consultations and adherence to the recommendations of the infectious disease physicians in hospitalized elderly patients.

Materials and Method: This retrospective study was conducted in Zonguldak Karaelmas University Teaching and Research Hospital. Hospitalized patients aged 65 years and over for whom an infectious disease consultation was requested between January 2010 and January 2011 were included in the study.

Results: The most common causes of consultation requests were the presence of high fever alone, leukocytosis alone, infiltration on chest X-ray, and skin and soft tissue infections. The most commonly diagnosed infections by the infectious disease physicians were community-acquired pneumonias, nosocomial pneumonias and urinary tract infections. In 99 patients, empirical antimicrobial therapy was initiated prior to the infectious disease consultation request, and the most commonly used antibiotics were third-generation cephalosporins and ciprofloxacin ± ampicillin-sulbactam. The most common antimicrobial regimens initiated after the consultation were carbapenems, piperacillin-tazobactam and cefoperazone-sulbactam. The mortality rate of the patients in whom the initiated antibiotic treatment regimens were broadened was significantly higher than the mortality rate of the patients in whom the treatment regimens were not changed and in patients whose treatment was initiated by the infectious disease physicians. Adherence to the recommendations was complete in 292 of 303 consultations.

Conclusion: The empirical treatment of hospitalized elderly patients may include broader spectrum antibiotics. Adherence to the recommendations of the infectious disease team may help solve serious and complex infectious problems.

Key Words: Aged; Communicalde Disease; Refferal and Consultation.

ARAŞTIRMA

HASTANEDE YATAN YAŞLI HASTALARDA ENFEKSİYON HASTALIKLARI KONSÜLTASYONLARI

ÖZ

Giriş: Çalışmanın amacı hastanede yatan yaşlı hastaların enfeksiyon hastalıkları konsültasyonlarının, konsültasyon öncesinde ve sonrasında antibiyotik kullanımlarının ve enfeksiyon hastalıkları uzmanlarının önerilerine uyumun değerlendirilmesiydi.

Gereç ve Yöntem: Bu retrospektif çalışma Zonguldak Karaelmas Üniversitesi Eğitim ve Araştırma Hastanesi'nde yapıldı. Atmış beş yaş ve üzerinde olan, Ocak 2010 ve Ocak 2011 yılları arasında hastanede yatıp enfeksiyon hastalıkları konsültasyonu istenen hastalar çalışmaya dahil edildi.

Bulgular: En sık konsültasyon istenme nedenleri yalnızca ateş, yalnızca lökositoz, akciğer radyogramında infiltrasyon ve deri ve yumuşak doku enfeksiyonu varlığıydı. Enfeksiyon hastalıkları uzmanlarınca sık konulan tanılar toplum kökenli pnömoni, nozokomiyal pnömoni ve idrar yolu enfeksiyonuydu. Konsültasyon öncesinde 99 hastaya ampirik antimikrobiyal tedavi diğer klinisyenler tarafından başlandı ve en sık başlanan antibiyotikler üçüncü kuşak sefalosporinler, siprofloksasin veya ampisilin-sulbaktam ve siprofloksasin kombinasyonuydu. Konsültasyon sonrasında enfeksiyon hastalıkları uzmanları tarafından en sık başlanan antibiyotikleri ise karbapenemler, piperasilin- tazobaktam veya sefaperazon-sulbaktam oluşturdu. Başlangıç antibiyotik tedavileri genişletilen hastaların mortalitesi, başlangıç tedavileri değiştirilmeyen ve enfeksiyon hastalıkları uzmanlarınca başlanan hastaların mortalitesinden istatistiksel olarak anlamlı yüksekti. Enfeksiyon hastalıkları uzmanlarının önerilerine 303 konsültasyonun 292'sinde tam olarak uyuldu.

Sonuç: Yaşlı hastaların ampirik tedavisi geniş spektrumlu antibiyotikleri içerebilmektedir. Enfeksiyon hastalıkları uzmanlarının önerilerine uyulmasıyla ciddi ve karmaşık enfeksiyöz problemler daha kolay çözülebilmektedir.

Key Words: Yaşlı Hastalar; Enfeksiyon Hastalığı; Konsültasyon.

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INTRODUCTION

Although aging is a natural part of our lives, elderly patients are vulnerable to serious and complicated infections, and they have the greatest risk of death as a result of these infections (1). In our country, the major role of infectious disease (ID) specialists working in hospitals is to institute antibiotic control programs and to evaluate patients with infections. As most of the hospitalized elderly patients have a history of co-morbid diseases and prior hospitalization, the occurence of infections with drug-resistant pathogens is frequent in these patients. Prompt recognition of infection and early appropriate empirical antibiotic therapy are major factors that influence final outcomes (2-5).Since 2003, our hospital has had an infection control program and team. Following the implementation of a restriction policy in 2003, the prescription of broad-spectrum antibiotics was placed under the control of ID physicians. In our study, we aimed to evaluate the various features of ID consultations, antibiotic usage and adherence to the recommendations of the ID team among hospitalized elderly patients. We also investigated the distribution of the features of the infections and antibiotic usage in patients aged 65-75 years old and 75 years and over.

MATERIALS VE METHOD

Hospital Setting and Study Design

Karaelmas University Teaching and Research Hospital is a 450-bed tertiary care hospital in Zonguldak, Turkey. The hospital contains all major wards, including medical and surgical subspecialties, and medical and surgical intensive care units (ICUs). This retrospective study was conducted between January 2010 and January 2011. The Infectious Diseases and Clinical Microbiology Department has an inpatient ward and this department also provides consultation services to other departments. Four ID specialists performed all of the consultations and the same team provided follow-up services to patients until the infectious problems were resolved, or until a diagnosis was made and an empirical antibiotic regimen was recommended. This recommendation was made according to each patient's clinical condition and his severity of the illness. This study was approved by the hospital ethical board.

Data Collection

All of the hospitalized patients aged 65 years and over for whom an infectious disease consultation was requested during the study period were included in this study. Inpatient consultations were recorded on a form that included name, age, sex, hospital ward, purpose of consultation, admission diagnosis, antibiotic usage before the consultation, type of infection, empirical antibiotic treatment, adherence to recommendations and the duration of the follow-up period. The empirical antibiotic treatment choice was made according to the pathogens responsible for the suspected infection site. Appropriate antimicrobial treatment was defined as the usage of antibiotics that have in vitro activity against the isolated pathogens or the presence of a clinically proven response when used with adequate dosage and time intervals. Antimicrobial treatment was defined as inappropriate when the prescribed agent was not effective against the infecting microorganism(s) isolated from the infection sites or when there was clinical deterioration within 72 hours of the initiation of treatment, such as a lack of response, worsening of fever, respiratory condition, radiographic status, or intervention with mechanical ventilation, aggressive fluid resuscitation or vasopressors (6). We could not evaluate the appropriateness of the antibiotic treatment initiated before the consultation request according to local guidelines because no local guidelines were available in our hospital.

A body temperature of ≥38°C or ≤35.5°C, leukocytosis or leukopenia, clinical findings such as a new or progressive infiltrate on chest X-ray, purulent sputum, purulent tracheal aspirate, and purulent drainage from the operation drain were considered to be indicative of possible infection. If there was a clinical suspicion of infection, samples from the suspected infection sites were sent for Gram stain and culture. Infections were considered to be community-acquired if they occured within 48 hours of hospitalization in patients who had not recently been in a health care facility or nursing home, patients who had not recently had an infusion therapy, patients who had not been hospitalized in an acute care hospital for two or more days within 90 days of the infection or patients who had not had regular attendance at a dialysis. Infections that were clinically suspected and diagnosed after 48 hours of hospitalization were considered to be nosocomial. The nosocomial infections were diagnosed according to the Centers for Disease Control and Prevention (CDC) definitions (7, 8). Patients with pneumonia were classified into either a community acquired pneumonia (CAP) or nosocomial pneumonia group according to the Pneumonia Diagnosis and Treatment Consensus reports by the Turkish Thoracic Society on community- and hospital-acquired pneumonia (9, 10). Community-acquired and nosocomial pneumonias were further grouped into groups 1-3 according to these consensus

reports (9, 10). Pneumonia severity index (PSI) scores were calculated in the CAP group and were classified into five classes according to PSI scores (9). Health care-associated pneumonia was considered in any patient who fulfilled any of the following criteria: 1) hospitalization in an acute care hospital for two or more days within 90 days of the infection; 2) residence in a nursing home or long-term care facility; 3) infusion therapy, such as intravenous antibiotic therapy, chemotherapy or wound care within 30 days of a current infection; and 4) regular attendance at a dialysis clinic, including hemodialysis and peritoneal dialysis (11). All health care-associated pneumonia patients were assessed in the nosocomial pneumonia group (6). Broadening of antibiotic treatment was considered if there was no clinical or microbiological response or the clinical status was worsening and/or the isolated causative bacteria was resistant to initial antibiotic therapy according to in vitro susceptibility testing (12). Mortality attributed to infection was considered if death occurred during the hospitalization period without the resolution of signs and symptoms of infection and if there was no other identified cause (13).

Statistical Analysis

The collected data were analyzed with SPSS version13.0. Group comparisons were done using the Chi-squared test for categorical variables, and significance was defined as $p<0.05$.

Results

During the study period, a total of 303 consultations were recorded, including 153 male patients (50.5%) and 150 female patients (49.5%). The mean age of the patients was 75.16±6.67, ranging between 65-98 years. There were 139 patients between 65 and 75 years of age. In this study group 164 patients were 75 years of age and older. Most of the consultations were requested from the gastroenterology (16.5%), oncology-hematology (13.9%) and nephrology (13.2%) departments. In total 112 patients (39.6%) were hospitalized in intensive care units (85.7% in medical ICUs, 14.3% in surgical ICUs). Most of the consultations were requested because of the presence of high fever (33.7%) alone, leukocytosis (17.5%) alone, infiltration on chest X-ray (5.9%) and skin and soft tissue infections (5.9%) (Table 1). After the ID consultations, no infectious focus was determined in 28 (9.2%) of the patients. In the remaining 275 patients, the most common diagnoses made by the ID consultants were CAP (17.1%) alone, nosocomial pneumonia (14.9%) alone and urinary tract infection (12.4%) alone (Table 2). While 7 (17.1%) of 41 patients with nosocomial pneumonia were in group II, 34 patients (82.9%) were in group III. According to the PSI scores, 68.9% of the CAP patients were in class IV and 31.1% were in class V. Twenty-three (37.7%) of 61 CAP patients were in group II and 38 patients (62.3%) were in group III. Twenty-eight patients with pneumonia were diagnosed as having health care-associated pneumonia (12 were hemodial-

Table 1— Most Common Causes of Infectious Disease Consultations

Purposes	All Patients (n=303) n (%)	Aged 65-75 (n=139) n (%)	Aged ≥75 (n=164) n (%)
Fever	102 (33.7)	52 (37.4)	50 (30.5)
Leukocytosis	53 (17.5)	21 (15.1)	32 (19.5)
Infiltration in chest X-ray	18 (5.9)	8 (5.8)	10 (6.1)
Skin and soft tissue infection	18 (5.9)	10 (7.2)	8 (4.9)
Fever and interpretation of the culture results	17 (5.6)	2 (1.4)	15 (9.2)
Neutropenic fever	17 (5.6)	10 (7.2)	7 (4.3)
Fever and leukocytosis	13 (4.3)	6 (4.3)	7 (4.3)
Sepsis	17 (5.6)	5 (3.6)	12 (7.3)
Interpretation of the culture results	15 (5.0)	5 (3.6)	10 (6.1)
Selection of an antimicrobial treatment regimen	9 (3.0)	9 (6.5)	– (–)
Intra-abdominal infection	8 (2.6)	3 (2.2)	5 (3.0)
Urinary tract infection	6 (2.0)	3 (2.2)	3 (1.8)
Other	10 (3.3)	5 (3.6)	5 (3.0)

Table 2— Most Common Diagnoses After the Consultations of Infectious Disease Specialists

Diagnoses	All Patients (n=275) n (%)	Aged 65-75 (n=131) n (%)	Aged ≥75 (n=144) n (%)
Community acquired pneumonia	47 (17.1)	21 (16.0)	26 (18.1)
Nosocomial pneumonia	41 (14.9)	16 (12.2)	25 (17.4)
Urinary tract infection	34 (12.4)	14 (10.7)	20 (13.9)
Intra-abdominal infection	26 (9.5)	12 (9.2)	14 (9.7)
Skin and soft tissue infection	25 (9.1)	14 (10.7)	11 (7.6)
Community acquired sepsis	23 (8.4)	13 (9.9)	10 (6.9)
Neutropenic fever	22 (8.0)	15 (11.5)	7 (4.9)
Primary blood stream infection	17 (6.2)	6 (4.6)	11 (7.6)
Nosocomial sepsis	14 (5.1)	9 (6.9)	5 (3.5)
Urinary tract infection and community acquired pneumonia	14 (5.1)	4 (3.0)	10 (6.9)
Other	12 (4.4)	7 (5.3)	5 (3.5)

ysis patients, 7 were hospitalized for two or more days within 90 days of the infection, 5 were nursing home residents, 4 had chemotherapy within 30 days). These patients were included in nosocomial pneumonia group. None of the patients were living in long-term care facilities. The remaining patients were living in the community with their families before hospitalization to our hospital.

In 99 patients (32.7%) an empirical antimicrobial therapy was initiated prior to the ID consultation requests (Table 3). Antimicrobial treatment was not initiated in the remaining 204 patients (67.3%) prior to the recommendation of the ID consultant. Sixty-three of the 99 patients (63.6%) in whom empirical antimicrobial treatment was initiated prior to the ID evaluation were 75 years and older. The most common antibiotics given by the other physicians prior to the ID consultation were third-generation cephalosporins (38.4%), ciprofloxacin (20.2%) and a combination of ampicillin-sulbactam and ciprofloxacin (18.2%) (Table 3).

After the evaluation of the ID specialists, the empirical antimicrobial regimens in 77 patients (77.8%) were broadened because the treatment was considered inappropriate. The treatment regimens in the remaining 22 (22.2%) patients was found to be appropriate. Forty-nine (63.6%) of the 77 patients in whom the initial empirical treatment was changed were 75 years and older. In 176 patients (64%) the initial antimicrobial treatment was initiated by the ID consultant. Antimicrobial usage after consultation is provided in Table 4. In 137 (49.8%) patients, there was a microbiologically documented infection. The most commonly isolated microorganisms were *Escherichia coli* (45.2%), *Pseudomonas aeruginosa* (22.6%), *Staphylococcus aureus* (13.9%), and *Acinetobacter baumannii* (8.8%). Thirty-six (58.1%) of the *E. coli* isolates had extended-spectrum beta lactamases. Twelve (63.2%) of the *S. aureus* isolates were methicillin resistant. The distribution of these microorganisms according to the infection sites is shown in Table 5. Blood (36.5%), tracheal aspirate (24.1%)

Table 3— Most Common Antimicrobial Regimens Initiated Before Infectious Disease Consultation

Antimicrobial Regimen	All Patients (n=99) n (%)	Aged 65-75 (n=36) n (%)	Aged ≥75 (n=63) n (%)
Third generation cephalosporin	38 (38.4)	14 (38.9)	24 (38.1)
Ciprofloxacin	20 (20.2)	6 (16.7)	14 (22.2)
Ampicillin-sulbactam + ciprofloxacin	18 (18.2)	5 (13.9)	13 (20.6)
Second generation cephalosporin	8 (8.1)	5 (13.9)	3 (4.8)
Ampicillin-sulbactam	7 (7.1)	1 (2.8)	6 (9.5)
First generation cephalosporin	4 (4.0)	3 (8.3)	1 (1.6)
Beta-lactam/ beta-lactamase inhibitor (Piperacillin-tazobactam or cefoperazone-sulbactam)	4 (4.0)	2 (5.6)	2 (3.2)

Table 4— Most Common Antimicrobial Regimens Initiated After Infectious Disease Consultation

Antibiotics	All Patients (n=253) n (%)	Aged 65-75 (n=122) n (%)	Aged ≥75 (n=131) n (%)
Carbapenem	56 (22.1)	23 (18.9)	33 (25.2)
Beta-lactam/ beta-lactamase inhibitor (Piperacillin-tazobactam or cefoperazone-sulbactam)	56 (22.1)	24 (19.7)	32 (24.4)
Fluoroquinolones	40 (15.8)	22 (18.0)	18 (13.7)
Glycopeptide + Carbapenem or Beta-lactam and beta-lactamase inhibitor or Fluoroquinolone	36 (14.2)	19 (15.6)	17 (13.0)
Ampicillin-sulbactam	31 (12.3)	22 (18.0)	9 (6.9)
Third generation cephalosporin	26 (10.3)	10 (8.2)	16 (12.2)
Other	8 (3.2)	2 (1.6)	6 (4.6)

and urine (17.5%) were the most common culture sites in which the microorganisms were isolated. In 58 (21.1%) patients antimicrobial susceptibility results of the isolated pathogens were available when the ID specialists initiated antimicrobial treatment. In 33 patients (12%), the isolated pathogens were susceptible to the empirical antimicrobial therapy recommended by the ID specialist. The initial antimicrobial therapy had to be changed in 46 patients (16.7%) because the isolated pathogens were resistant to the regimen. Adherence to the ID physicians' recommendations was complete in 292 of 303 (96.4%) consultations. A total of 204 patients (67.3%) were followed up by the ID consultant until the infection was resolved, the patient was discharged or death occurred. In total, 199 patients (65.7%) were followed up in the other wards and 5 patients (1.6%) were transferred to the ID ward. The mortality attributed to infection was 19.2%. There was no statistically significant difference for mortality between the patients who were followed up until the resolution of infection, discharge or death, and the patients who were not followed up daily (p=0.364). The mortality rate of the patients in whom the antibiotic treatment regimens were broadened (31.2%) was higher than the mortality rate of the patients in whom the treatment regimens were not changed and in patients whose treatment was initiated by the ID physicians (12.8%) (p<0.001).

Discussion

In our study, first of all we wanted to analyze the infectious disease consultations of hospitalized elderly patients. Second we wanted to evaluate the antimicrobial treatment regimens given before and after ID consultations. Our third aim was to investigate the common causes of ID consultation requests, and the distribution of the antimicrobial treatment

Table 5— Microorganisms and Infection Diagnosis

Infection Sites	*Escherichia coli* (n=62) n (%)	*Pseudomonas aeruginosa* (n=31) n (%)	*Staphylococcus aureus* (n=19) n (%)	*Acinetobacter baumannii* (n=12) n (%)
Community acquired pneumonia	6 (9.7)	3 (9.7)	4 (21.1)	0 (0.0)
Nosocomial pneumonia	9 (14.5)	7 (22.6)	1 (5.3)	7 (58.3)
Urinary tract infection	12 (19.4)	1 (3.2)	4 (21.1)	0 (0.0)
Intra-abdominal infection	8 (12.9)	1 (3.2)	0 (0.0)	0 (0.0)
Skin and soft tissue infection	1 (1.6)	5 (16.1)	6 (31.6)	1 (8.3)
Community acquired sepsis	11 (17.7)	2 (6.5)	1 (5.3)	– (–)
Neutropenic fever	– (–)	7 (22.6)	– (–)	– (–)
Primary blood stream infection	7 (11.3)	3 (9.7)	2 (10.5)	1 (8.3)
Nosocomial sepsis	8 (12.9)	1 (3.2)	1 (5.3)	3 (25.0)
Other	– (–)	1 (3.2)	– (–)	– (–)

regimens among patients aged 65-75 years-old and 75 years old and over. Most of the consultation requests were made by the gastroenterology, oncology-hematology and nephrology departments. We think it is because of the elderly patients represent an at-risk population and because the physicians in these departments attended ID team training. In another study that evaluated inpatient ID consultations, it was reported that most of the consultation requests were made by the Department of Orthopedics. The mean patient age in this study was younger than in our patients, and the most common cause of the consultation requests was unexplained fever (14). Similarly, unexplained fever and/or leukocytosis were the most common causes of the consultation requests in our study. While in our country, well-known infections like brucellosis, typhoid fever, and malaria exists, none of the patients in our study were diagnosed with these diseases. This finding may be because of a decrease in the frequency of these infections with socio-economic development. Similarly, in two other studies from our country, pneumonia, sepsis, skin and soft tissue infection and urinary tract infection were the most common diagnoses among geriatric patients hospitalized in the ID department (15,16). After the implementation of a restriction policy in 2003, the usage of broad-spectrum antimicrobial agents, such as carbapenems, piperacillin-tazobactam, cefoperazone-sulbactam, and parenteral flouroquinolones was placed under the authorization of an ID specialist. Empirical antimicrobial treatment was initiated by the ID consultant in most of the patients in our study which could have been because of legal restrictions, infection control programs and ongoing training programs in our hospital. In another study conducted when there were no legal antibiotic restrictions in our country, empirical antimicrobial treatment regimens were initiated by other clinicians in 67.1% of the patients without a request for an ID consultation (14). Surprisingly, none of the empirical antimicrobial regimens initiated by other clinicians were discontinued by the ID consultants. Instead, the initial treatment spectrum was broadened by the ID specialists in most of the consulted patients. These treatment spectrums may have been broadened because patients in this study were 65 years old and older who usually have serious infections, poor clinical status and isolated microorganisms have broad-range resistance. The most common antibiotics used by clinicians prior to the ID recommendations were third-generation cephalosporins and fluoroquinolones because most of the ID consultations were requested from the gastroenterology department for patients who were suspected of having an intraabdominal infection. The empirical treatment initiated by the other specialists was necessary because it was not discontinued in any of the consulted patients rather the spectrum was broadened in most of the patients after the evaluation of the ID specialist. The mortality rate of the patients in whom the antibiotic treatment was broadened was statistically higher than the mortality rate of the other patients. This finding conveys the importance of ID consultations and the importance of appropriate empirical antibiotic treatment in elderly patients. We speculate that if the ID consultations had been requested promptly when the physicians suspected from an infection, there would not have been a delay in initiating appropriate treatment in the patients whose treatment was broadened by the ID specialists, and the mortality rate may have been lower. Although one of the main duties of an ID physicians is to restrict the antibiotic usage, in our study the ID specialists had suggested broader spectrum antibiotics after their evaluations because in these cases there was either a resistant pathogen isolated or there was no clinical response to the initial regimen (17,18). In this study *E. coli* was the most commonly isolated microorganism and most of the *E. coli* isolated had extended-spectrum beta-lactamase. The other isolated microorganisms were antibiotic-resistant bacteria such as *P. aeruginosa*, and *A. baumannii*. The most commonly diagnosed infections were CAP and nosocomial pneumonia. In this study, most of the CAP and nosocomial pneumonia patients were in group III. The isolation of resistant bacteria and the serious clinical status of the patients determined the situations in which the ID specialists recommended broader spectrum antibiotics such as carbapenems and beta-lactam/beta-lactamase inhibitor combinations. An etiologic pathogen was isolated in approximately half of the patients in this study. In another published study, it was reported that a microbiological diagnosis had been established at the time of consultation for 41% of the patients (3). In our study, in most of the cases the initial antimicrobial treatment had to be initiated empirically before the culture results were available because most of the patients were over 65 years of age and clinically unstable. Most of the consulted patients were followed up by the ID team until their infections were resolved, until they were discharged, or until death however some patients were followed up for a shorter period of time until a clinical response to a recommended antimicrobial regimen was achieved. There was no statistically significant difference between the mortality rates of these two groups however this result may be misleading, because the patients who were clinically stable and in whom the etiologic agents were microbiologically documented were followed

up for a shorter period of time. In these patients a high mortality rate attributed to infection was not expected. And the expected high mortality rate may be decreased in the other group that was followed up until resolution of infectious problem, discharge or death due to the prompt recognition of infection, early appropriate therapy, closely monitoring the clinical response and closely monitoring the adverse reactions of antibiotics. Although the authors of some published studies suggest that an average of one or two follow up visits after the ID consultation was optimal, we believe that following up by daily rounds until the infections resolve, or until discharge or death is more appropriate in elderly and clinically unstable patients (2, 19). We think, daily rounds will help to closely monitor the clinical responses of the patients and to initiate the appropriate antibiotic therapy according to the isolated infective agent without delay.

In conclusion, empirical treatment of the hospitalized elderly patients may include broader spectrum antibiotics. Consultation with the patients in the ID department and adherence to the recommendations of physicians may aid in the resolution of serious and complex infections that may be present in these patients and may help rationalize the use of antibiotics.

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