Candiduria in hospitalized patients: an investigation with the Sysmex UF-1000i urine analyzer

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Background. Candiduria is common in hospitalized patients. Its management is limited because of inadequate understanding. Previous epidemiological studies based on culture assay have been limited to small study populations. Therefore, data collected by automated systems from a large target population are necessary for more comprehensive understanding of candiduria in hospitalized patients. **Methods.** To determine the performance of the Sysmex UF-1000i in detecting candiduria, a cross-sectional study was designed and conducted. A total of 203 yeast-like cell (YLC)-positive and 127 negative samples were randomly chosen and subjected to microbiologic analysis. The receiver operating characteristic curve (ROC) was used to evaluate the ability of YLC counts as measured by the Sysmex UF1000i to predict candiduria. Urinalysis data from 31,648 hospitalized patients were retrospectively investigated, and statistical analysis was applied to the data collected. **Results.** Using a cutoff value of 84.6 YLCs/μL, the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the yeast like cell (YLC) counts to predict candiduria were 61.7%, 84.1%, 88.6% and 66.3%, respectively. *C. glabrata* (33.6%) and *C. tropicalis* (31.4%) were more prevalent than *C. albicans* (24.3%) in the present study. Of the investigated hospitalized patients, 509 (1.61%) were considered candiduria-positive. Age, gender and basic condition were associated with candiduria in hospitalized patients. In the ICU setting, urinary catheterization appeared to be the only independent risk factor contributing to candiduria according to our investigation. Although antibiotic therapy has been reported to be a very important risk factor, we could not confirm its significance in ICU candiduria patients because of excessive antibiotic usage in our hospital. **Conclusions.** The YLC measured by Sysmex UF-1000i is a practical and convenient tool for clinical candiduria screening prior to microbiologic culture. Candiduria is common in hospitalized patients, and its incidence varies according to age, gender and the wards where it is isolated. Candiduria had no direct connection with mortality but might be considered a marker of seriously ill patients who need particular attention in the clinic.

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2 **urine analyzer**

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22   **Abstract**

23   **Background.** Candiduria is common in hospitalized patients. Its management is limited because

24   of inadequate understanding. Previous epidemiological studies based on culture assay have been

25   limited to small study populations. Therefore, data collected by automated systems from a large

26   target population are necessary for more comprehensive understanding of candiduria in

27   hospitalized patients.

28   **Methods.** To determine the performance of the Sysmex UF-1000i in detecting candiduria, a cross-

29   sectional study was designed and conducted. A total of 203 yeast-like cell (YLC)-positive and 127

30   negative samples were randomly chosen and subjected to microbiologic analysis. The receiver

31   operating characteristic curve (ROC) was used to evaluate the ability of YLC counts as measured

32   by the Sysmex UF1000i to predict candiduria. Urinalysis data from 31,648 hospitalized patients

33   were retrospectively investigated, and statistical analysis was applied to the data collected.

34   **Results.** Using a cutoff value of 84.6 YLCs/μL, the sensitivity, specificity, positive predictive

35   value (PPV) and negative predictive value (NPV) of the yeast like cell (YLC) counts to predict

36   candiduria were 61.7%, 84.1%, 88.6% and 66.3%, respectively. *C. glabrata* (33.6%) and *C.*

37   *tropicalis* (31.4%) were more prevalent than *C. albicans* (24.3%) in the present study. Of the

38   investigated hospitalized patients, 509 (1.61%) were considered candiduria-positive. Age, gender

39   and basic condition were associated with candiduria in hospitalized patients. In the ICU setting,

40   urinary catheterization appeared to be the only independent risk factor contributing to candiduria

41   according to our investigation. Although antibiotic therapy has been reported to be a very

42   important risk factor, we could not confirm its significance in ICU candiduria patients because of

43   excessive antibiotic usage in our hospital.

44   **Conclusions.** The YLC measured by Sysmex UF-1000i is a practical and convenient tool for

45   clinical candiduria screening prior to microbiologic culture. Candiduria is common in hospitalized

46   patients, and its incidence varies according to age, gender and the wards where it is isolated.

47   Candiduria had no direct connection with mortality but might be considered a marker of seriously

48   ill patients who need particular attention in the clinic.

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50

51 **Introduction**

52 Candiduria, defined as various Candida species found in the urine, is becoming an increasingly

53 serious problem in hospitalized patients. Antibiotics, corticosteroids, immunosuppressive agents,

54 and urinary catheters, all of which are used extensively in clinical practice, are regarded as possible

55 risk factors [1]. The presence of Candida in urine does not always signify a fungal urinary tract

56 infection (UTI) and may derive from colonization or sample contamination [2]. Nevertheless,

57 candiduria could be considered a valuable clue to the diagnosis and treatment of fungal UTIs,

58 especially in high-risk hospitalized patients. Numerous studies in experimental animals and

59 clinical observations have indicated that the kidney consistently acts as the main fungus-bearing

60 organ during candida infection [3-5]. In severely ill patients, candiduria has been considered to be

61 significantly associated with disseminated candidiasis [6-8]. In surgical intensive care unit (ICU)

62 settings, candiduria has been proved to be an independent factor associated with mortality [9].

63 For most clinical laboratories, urine culture is the first-line technique to determine candiduria. This

64 conventional manual assay is time consuming, labor intensive and unsuitable for large-scale

65 screening and investigation purposes. For a long time, flow cytometry was regarded as a useful

66 tool for yeast characterization [10]. By utilizing fluorescent staining and flow cytometric

67 technology, the Sysmex UF-1000i system measures each detected formed element, including fungi

68 in urine, simply and efficiently. Several studies [11-13] have supported the reliability of an

69 automatic urine analysis system for bacteria and yeast-like cell (YLC) detection.

70 Previous epidemiological studies of candiduria [14-16] have been based on culture assay and

71 limited to small study populations. Hence, further data collected by automated systems from a

72 large target population are necessary for more comprehensive understanding of candiduria in

73 hospitalized patients. The aim of this study was to collect epidemiological data on candiduria with

74 the Sysmex UF-1000i urine flow cytometry analysis system and to assess the incidence of

75 candiduria in hospitalized patients. The risk factors and outcomes of ICU candiduria patients were

76 also investigated in this study.

77

78 **Materials & Methods**

79 **Study population**

80 This study was conducted between September 1, 2016, and August 31, 2017, in Bethune

81 International Peace Hospital of PLA and was approved by the local research ethics committee

82 (approval number: 2016-KY-034). We studied 45,371 urine samples collected from 31,648

83 hospitalized patients, including 17,840 males and 13,808 females. The enrolled patients were aged

84 1 day to 106 years old with a median age of 56 years. Samples from infants younger than 3 years

85 accounted for 8.86% of the total number of samples. Clinical data, including age, gender, primary

86 diagnosis, risk factors (e.g., presence of catheter, antibiotics, parenteral nutrition, immunosuppressive

87 treatment, renal failure, abdominal surgery, diabetes and malignancy) and prognosis, were obtained from

88 medical records. For ICU patients, Acute Physiology and Chronic Health Evaluation (APACHE)

89 II scores were used to evaluate ICU admission severity.

90 Patients were instructed on how to collect mid-stream urine before sample collection. For babies

91 younger than 1 year, a sterile urine collection bag was applied according to the manufacturer's

92 instructions. The samples were collected in the morning and were stored in a disposable sterile

93 bottle with a screw lid. All samples were analyzed within 3 hours after collection.

94 All urine samples received were examined with a Sysmex UF-1000i analysis system and the count

95 of yeast-like cells (YLCs) was used as a candiduria marker [11]. For patients who underwent

96 repeated urine examinations, the maximum YLC count value was recorded.

97 **Microbiology analysis**

98 To determine the performance of the Sysmex UF-1000i in detecting candiduria, a cross-sectional

99 study was designed and conducted. A total of 203 YLC-positive and 127 negative samples were

100 randomly chosen and subjected to microbiological analysis. Briefly, 0.01 ml of each urine sample

101   was spread on a CHROMagar plate with a calibrated loop, and the culture plates were incubated

102   aerobically at 35 °C for 48 hours. The Candida species were identified based on growth color and

103   colony shape and were further confirmed by the API 20C AUX Yeast Identification System

104   (BioMerieux, France). The determined level for quantitative cultures to be considered significant

105   was 10^3 CFU/ml (10 CFU/plate).

106   **Statistical analysis**

107   The LOG YLC counts results of the culture-positive/negative groups are given as mean $\pm$

108   standard deviation (SD). The candiduria rate according to age groups, genders and wards were

109   statistically compared using Fisher's exact test. Risk factors for ICU patients were assessing by

110   logistic regression. Statistical analysis of YLC counts were performed with the Mann-Whitney

111   test. A P value < 0.05 was considered significant. Statistical analysis was performed using software

112   GraphPad Prism 7.0 and SPSS 17.0. The characteristics of YLC for determining candiduria,

113   including sensitivity, specificity, positive predictive value (PPV), and negative predictive value

114   (NPV), were calculated.

115

116   **Results**

117   **YLC detection capacity of the Sysmex UF1000i and cutoff value determination**

118   By microbiological culture assay, we isolated 132 strains of Candida species from 119 (119/203)

119   YLC-positive samples and 8 strains from 8 (8/127) YLC-negative samples. Table 1 displays the

120   prevalence of the 140 isolated Candida species strains, including 47 strains of *Candida glabrata*,

121   44 strains of *Candida tropicalis*, 34 strains of *Candida albicans*, 6 strains of *Candida krusei*, 4

122   strains of *Candida parapsilosis* and 5 strains of other species.

123   Figure 1A shows the YLC counts obtained from the YLC-positive samples. Compared to that of

124   the culture-negative group, the YLC count (LOG n) of the culture-positive group was significantly

125   higher (2.259 ± 0.067 VS 1.524 ± 0.052, $P < 0.001$). The receiver operating characteristic curve

126   (ROC) was utilized to evaluate the predictive ability of the Sysmex UF1000i YLC count to predict

127   candiduria. The sensitivity and specificity were calculated based on a determined cutoff value of

128   the ROC curve. As Figure 1B shows, the area under the curve (AUC) was 0.789 with a 95%

129   confidence interval of 0.728 - 0.851. The Youden index (sensitivity + specificity - 1) was

130   generated, and 84.6 YLCs/µL was determined as the best cutoff value. The sensitivity, specificity,

131   PPV and NPV of the YLC counts to determine candiduria were 61.7%, 84.1%, 88.6% and 66.3%,

132   respectively.

133   **Characteristics of patients with candiduria**

134   For the investigated samples, 684 of 45,371 (1.51%) were determined to be positive, and 509 of

135   31,648 (1.61%) patients were considered candiduria-positive with a YLC cutoff value of 84.6

136   YLCs/µL.

137   Table 2 shows the age and gender distribution of the candiduria patients. The enrolled patients

138   were divided into 5 age groups, and per-age maximum candiduria determination was displayed as

139   follows: <1 group (3.41%), followed by the 60+ (2.51%) and 18 ~ 59 groups (1.06%). The 1 ~ 6

140   (0.20%) and 7 ~ 17 groups (0.54%) showed very low candiduria rates. Of the 509 positive patients,

141   235 were male, and 274 were female, and the candiduria occurrence rate was statistically higher

142   in female patients than in male patients ($P < 0.001$).

143   Underlying disease was recognized as the main factor for candiduria. Table 3 exhibits the ward

144   distribution of the candiduria patients. Generally, candiduria rates in patients from internal

145   medicine wards were more than two times higher than those of patients in the surgical wards

146   (1.98% vs 0.94%, $P < 0.001$). The ICU (22.89%), nephrology (7.06%), geriatrics (5.66%), NICU

147   (3.66%), neurosurgery (2.94%), hematology (2.78%), oncology (2.60%) and respiratory (2.54%)

148   wards were the leading wards for candiduria, with occurrence rates were significantly higher than

149   the average rate (1.61%).

150   **Risk factors and outcome of ICU candiduria patients**

151 Subjects in this study included 166 patients from the ICU of our hospital, among whom 38 were

152 identified as having candiduria (38/166, 22.89%). Previous reports showed high candiduria rates

153 in ICU patients, and we further investigated the risk factors and outcomes of the ICU candiduria

154 patients.

155 Among the several risk factors investigated, the presence of a catheter was found to be statistically

156 significant by multi-factor logistic regression analysis ($P < 0.05$, Table 4). Other factors, including

157 age > 60 years, antibiotic and immunosuppressive therapy, parenteral nutrition, abdominal

158 surgery, diabetes, malignancy, renal failure and APACHE Ⅱ scores were not found to be

159 statistically significant.

160 A total of 26 ICU investigated patients died in hospital (13 were identified with candiduria and 13

161 did not). The death rate was significantly higher among candiduria patients than among those

162 without candiduria (13/38 VS 13/128). For the 38 ICU candiduria subjects, 8 received antifungal

163 therapy, and 2 of them died; 30 did not receive antifungal treatment, and 11 of them died. There

164 was no significant difference between the death rates of patients who received antifungal therapy

165 and of those who did not (2/8 VS 11/30). One candiduria patient was clinically diagnosed as having

166 candidemia with a positive blood culture of *Candida albicans*. This patient died within 15 days

167 despite aggressive antifungal therapy.

168

169 **Discussion**

170 The Sysmex UF-1000i is a fully automatic fluorescence cytometric urine analyzer capable of

171 detecting various urine particles, including bacteria (BACT), red cells (RBCs), white cells

172 (WBCs), yeast-like cells (YLCs), epithelial cells, casts, crystals, spermatozoa, small round cells

173 and mucus [17]. Several studies [11-13] have shown that the Sysmex UF-1000i analyzer can

174 determine UTIs and candiduria in a simple manner with considerable quantification. Our data

175 indicated that the sensitivity, specificity, PPV, and NPV were 61.7%, 84.1%, 88.6% and 66.3%,

176 respectively, using a cutoff value of 84.6 YLCs/µL. According to a report from Gutiérrez-

177 Fernández J *et al*.[11], the sensitivity, specificity, PPV and NPV of urine YLC counts for

178 determining candiduria were 87.3%, 97.0%, 9.3% and 99.9%, respectively, with a cutoff value of

179 ≥ 50 YLCs/µL. Compared to the present study, their study used a relatively low cutoff value and

180 enrolled all YLC-negative subjects into the calculation, leading to a very low PPV. When

181 determining the cutoff value, we only included the YLC-positive subjects in the calculation

182 because the main question of the present study was whether positive YLC indicated candiduria.

183 The urinary tract is one of the most frequent sites for candida colonization, and the presence of

184 candida in urine should not be ignored because candida colonization is a risk factor for the progress

185 of invasive candidiasis (IC) [18, 19]. In our study, the general incidence of candiduria was 1.61%

186 in hospitalized patients. Actually, according to limited data available, the candiduria incidence

187 rates were varied from 0.77% to over 20% [15, 20]. Our result was comparable to a clinic-based

188 retrospective and prospective study using culture assay conducted by Colodner *et al*.[20].

189 Compared to study data regarding candiduria epidemiology in community settings, by which the

190 candiduria rates were reported respectively as low as 0.4% [11] and 0.14% [20], our investigation

191 result is much higher in hospitalized patients. This result indicates that the incidence of candiduria

192 varied according to subject groups. *C. glabrata* and *C. tropicalis* were found more often than was

193 *C. albicans*, agreeing with the trend of non-albicans Candida prevalence worldwide. Especially in

194 the urinary tract, non-albicans Candida species were reported better-adapted to the environment

195 [21]. *C. glabrata* [22]and *C. tropicalis* [23] were identified as the most prevalent urinary tract

196 Candida species in various studies.

197 Candiduria occurrence rates varied according to age groups. The incidence was 2.51% in patients

198 older than 60 years and 3.41% in patients younger than 1 year, significantly higher than the overall

199 incidence rate (1.61%). Older age is a classical risk factor for candiduria[24]. In healthy babies,

200 the urinary tract is generally considered to be clean and without candida colonization, while in

201   NICU patients, particularly premature infants, candiduria and candidemia were not rare [25, 26].

202   Gender is another factor that may affect the candiduria incidence [27]. In the present study, the

203   candiduria incidence was significantly higher in females than in males. A possible explanation to

204   this finding may be the common colonization of Candida in the urogenital tract or Candida

205   vulvovaginitis in females [20, 28].

206   To explore the correlation between underlying diseases and candiduria in hospitalized patients, the

207   candiduria incidences in patients who were admitted to various wards were investigated. As

208   expected, ICU patients showed the highest candiduria incidence (22.89%). Patients from

209   nephrology (7.06%), geriatrics (5.66%), NICU (3.66%), neurosurgery (2.94%), hematology

210   (2.78%) and oncology (2.60%) wards also showed considerably high candiduria rates. This result

211   might imply that stays in the ICU, major surgery, very old/young age, diabetes, renal disease,

212   malignancy and immunosuppressive therapy, in addition to gender, could be considered to be

213   major risk factors for candiduria. For patients undergoing neurosurgery, whether a urinary catheter

214   was used in the peri-operative period is very important for the development of candiduria [28]. In

215   the present study, all 274 patients undergoing head operations had a record of urinary catheter

216   usage that might be a major cause of the high prevalence of candiduria in the neurosurgery ward.

217   In ICU patients, urinary catheterization appeared to be statistically significant risk factor. The

218   presence of a catheter in the urinary tract was always an important factor associated with

219   candiduria and various UTIs, as confirmed by many studies [29-32]. Previous antibiotic therapy

220   has been considered to be another important risk factor, playing a crucial role in the pathogenesis

221   of candiduria [33]. Excessive antibiotic use is widely recognized in the ICU patients we

222   investigated (142 of 166 patients had a record of antibiotic therapy). The high prevalence of

223   antibiotic use in ICU patients makes it difficult to clarify the role of antibiotic therapy in the

224   prevalence of candiduria or Candida colonization in our report.

225   The total mortality rate for ICU candiduria patients was 34.21%, approximately 3 times higher

226 than that of the non-candiduria patients. This figure is very close to the mortality rate reported by

227 Bougnoux ME *et al.* [34]. Antifungal treatment had no effect on the mortality of ICU candiduria

228 patients in our investigation. It appears likely that candiduria is a "red flag" or marker for seriously

229 ill patients who need particular attention to their indwelling devices or underlying disease but has

230 no direct contribution to the high mortality. Although the connection between candiduria and

231 candidemia has been reported by several groups [35], only 1 ICU candiduria patient was finally

232 diagnosed as having candidemia by microbiological culture in this study.

233 The findings of this study have to be seen in light of some limitations. First, the epidemiological

234 data are obtained from the Sysmex UF-1000i YLC parameter. The performance of YLC for

235 candiduria screening is relatively low, which might bias the results of our overall and subgroup

236 analyses. However, retrospectively investigating candiduria with YLC could greatly reduce the

237 selection bias caused by target population, for the reason that urine culture is warranted only when

238 the patient exhibits urinary tract infection symptoms in clinical practice, while urinalysis is

239 performed as a routine examination on each patient. Second, the sample size for ICU patients is

240 not big enough. Third, as a retrospective study, we only conduct follow-up evaluation for the

241 outcome of ICU patients.

242 **Conclusions**

243 To our knowledge, this is the first epidemiological study of candiduria with a large-scale

244 investigated population conducted using the Sysmex UF-1000i urine analyzer. The incidence rate

245 of candiduria in hospitalized patients was approximately 1.61% and varied according to age,

246 gender and the wards where they were isolated. Presence of catheter was the only independent risk

247 factor in ICU patients. Antifungal therapy had no effect on the mortality of ICU candiduria

248 patients, implying that candiduria was not directly associated with mortality.

249

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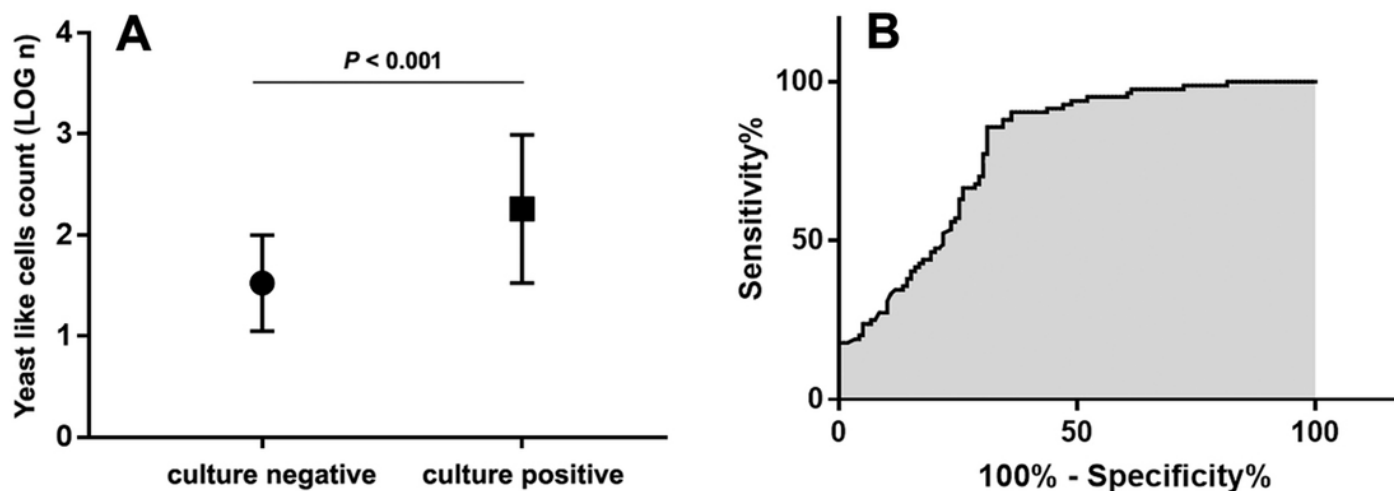
Figure 1

Figure 1 Yeastlike cells (YLC) performance for screening candiduria.

(A) For YLC positive samples, YLC count (LOG n) of culture positive samples is significantly higher than culture negative samples ($P < 0.001$). The error bars represent the standard deviations; (B) The receiver operating characteristic curve (ROC) was utilized to determine the cutoff YLC value for candiduria identifying. The area under the curve (AUC) was 0.789 and the cutoff value was determined as 84.6 YLCs/μL.

Prevalence of candida species in the urine investigated by culture

[a] 13 patients had > 1 candida species isolated at baseline.

[b] Includes *Candida guilliermondii*(2), *Candida lusitaniae* (1), *Saccharomyces cerevisiae* (1) and *Candida pseudotropicalis* (1).

1   Table 1 prevalence of candida species in the urine investigated by culture

Candida species	No. (%) indentified[a]
C. glabrata	47 (33.6)
C. tropicalis	44 (31.4)
C. albicans	34 (24.3)
C. krusei	6 (4.29)
C. parapsilosis	4 (2.86)
Other *C. spp.*[b]	5 (3.57)

2   [a] 13 patients had > 1 candida species isolated at baseline.

3   [b] Includes *Candida guilliermondii*(2), *Candida lusitaniae* (1), *Saccharomyces cerevisiae* (1) and *Candida*

4   *pseudotropicalis*(1).

Age and gender of 509 patients with candiduria

1   Table 2 Age and gender of 509 patients with candiduria

Characteristic	Candiduria (n = 509)	Non-candiduria (n = 31,139)
Age, years, n (%)		
<1	49 (3.41)	1,387
1~6	5 (0.20)	2,553
7~17	7 (0.54)	1,292
18~59	157 (1.06)	14,604
60~	291 (2.51)	11,303
Gender		
Male	235 (1.32)	17,605
Female	274 (1.98)	13,534

Number of candiduria patients from different medical wards

[a] CCU: cardiac care unit; NICU: neonatal intensive care unit; ICU: intensive care unit; ENT: ear, nose and throat.

[b] Compared with overall candiduria incidence rate (509/31648, 1.61%); P value < 0.05 was considered significant.

1   Table 3 Number of candiduria patients from different medical wards

Ward[a]	Candiduria, %	Non-candiduria	*P* value [b]
Internal medicine	411 (1.98)	20,802	0.02*
CCU	18 (1.38)	1,284	0.57
Gynaecology	10 (0.60)	1,654	0.0015*
Infectious disease	9 (1.74)	508	0.78
Hepatology	5 (0.62)	800	0.03*
Pediatrics	9 (0.33)	2,729	<0.0001*
NICU	42 (3.66)	1,104	<0.0001*
Respiratory	47 (2.54)	1,804	0.0016*
Emergency	2 (2.22)	88	0.66
Geriatrics	65 (5.66)	1,083	<0.0001*
Endocrinology	19 (1.58)	1,180	1.00
Neurology	12 (0.72)	1,656	0.0052*
Nephrology	68 (7.06)	895	<0.0001*
Gastroenterology	22 (1.68)	1,291	0.79
Cardiovascular	7 (0.30)	2,303	<0.0001*
Hematology	11 (2.78)	384	0.06
Rheumatology	8 (1.22)	649	0.46
Oncology	19 (2.60)	712	0.03*
ICU	38 (22.89)	128	<0.0001*
Surgery wards	98 (0.94)	10,337	<0.0001*
Hepatobiliary	4 (0.65)	615	0.07
ENT	11 (0.39)	2,793	<0.0001*
Orthopaedics	13 (0.84)	1,530	0.02*
Urology	17 (1.74)	961	0.70
General surgery	16 (0.87)	1,833	0.015*
Neurosurgery	19 (2.94)	627	0.0066*
Vascular surgery	7 (1.09)	637	0.32
Cardiothoracic	1 (0.26)	391	0.04*
Ophthalmology	4 (0.55)	726	0.02*
Obstetrics	6 (0.77)	774	0.07

2   [a] CCU: cardiac care unit; NICU: neonatal intensive care unit; ICU: intensive care unit; ENT: ear, nose and
3   throat.
4   [b] Compared with overall candiduria incidence rate (509/31648, 1.61%); *P* value < 0.05 was considered
5   significant.
6   * *P* < 0.05.

Table 4 Risk factors and outcome for ICU candiduria patients

*, *P* value < 0.05.

1   Table 4 Risk factors and outcome for ICU candiduria patients

Characteristic for ICU patients	Candiduria (n, %)	Non-candiduria (n, %)	Single-factor logistic regression analysis		Multi-factor logistic regression analysis	
			P value	Odds ratio (95% CI)	P value	Odds ratio (95% CI)
Risk factors						
APACHE Ⅱ score (median, interquartile range)	17 (12 – 23)	13 (9 – 16)	0.001*	1.109 (1.047 – 1.175)	0.774	0.932 (0.576 – 1.507)
> 60 years	28 (73.68)	90 (70.31)	0.561	1.273 (0.564 – 2.870)	0.911	1.051 (0.437 – 2.532)
Presence of catheter	22 (57.89)	41 (32.03)	0.004*	3.025 (1.437 – 6.369)	0.006*	3.161 (1.385 – 7.212)
Antibiotics	33 (86.84)	109 (85.16)	0.795	1.150 (0.399 – 3.318)	0.633	0.749 (0.228 – 2.456)
Parenteral nutrition	23 (60.53)	69 (53.91)	0.665	1.176 (0.566 – 2.444)	0.965	0.981 (0.417 – 2.308)
Immunosuppressive treatment	2 (5.26)	3 (2.34)	0.368	2.315 (0.372 – 14.390)	0.883	1.192 (0.115 – 12.377)
Abdominal surgery	4 (10.52)	7 (5.47)	0.377	1.765 (0.501 – 6.216)	0.366	1.902 (0.472 – 7.664)
Renal failure	19 (50.0)	38 (29.69)	0.057	2.054 (0.980 – 4.303)	0.077	2.203 (0.917 – 5.291)
Diabetes	14 (36.84)	35 (27.34)	0.262	1.550 (0.721 – 3.332)	0.473	1.372 (0.579 – 3.251)
Malignancy	6 (15.79)	12 (9.38)	0.269	1.812 (0.631 – 5.207)	0.098	3.348 (0.801 – 13.996)
Outcome						
Dead in hospital	13 (34.21)	13 (10.16)	0.001*	4.600 (1.904 – 11.113)	-	-
Discharge	25 (65.79)	115 (89.84)	-	-	-	-

2   *, P value < 0.05.