

网络出版时间: 2025-03-17 09:27:01 网络出版地址: <https://link.cnki.net/urlid/34.1065.R.20250314.1615.023>

# 不同年龄组重症社区获得性肺炎预后危险因素分析

张康<sup>1,2,3</sup>, 杨浩<sup>2</sup>, 荆惠<sup>2</sup>, 关胜男<sup>2</sup>, 张庆<sup>2</sup>, 谢凯<sup>1,2,3</sup>, 王海峰<sup>1,2,3</sup><sup>(1)</sup> 河南中医药大学第一附属医院呼吸与危重症医学科, 郑州 450000; <sup>(2)</sup> 河南中医药大学第一临床医学院, 郑州 450003; <sup>(3)</sup> 呼吸疾病中医药防治省部共建协同创新中心, 郑州 450003)

**摘要** 目的 探讨不同年龄组重症社区获得性肺炎(SCAP)预后危险因素。方法 采用多中心、前瞻性的研究方法,分析2017年12月—2021年10月,河南中医药大学第一附属医院等11家三甲医院收治的住院SCAP患者的临床资料。根据患者年龄分为老年组( $\geq 65$ 岁)和非老年组(18~64岁),分析SCAP临床特征。根据死亡与否分为存活组与死亡组,通过多因素Logistic回归分析确定SCAP死亡的危险因素。结果 170例SCAP患者被纳入研究,年龄20~93( $65.75 \pm 15.23$ )岁,其中老年SCAP比例为58.82%(100/170)。非老年SCAP住院病死率为24.3%(17/70),老年SCAP住院病死率为28%(28/100)。与非老年SCAP相比,老年SCAP入院时病情严重程度评分更高,合并症更多,但入院时发热、呼吸频率增快症状表现更不明显。多因素Logistic回归分析显示,入院时肺炎严重指数(PSI)评分( $P=0.016$ ,  $OR=1.022$ , 95%  $CI$  1.004~1.041)和有创机械通气( $P=0.037$ ,  $OR=4.543$ , 95%  $CI$  1.092~18.898)为非老年SCAP住院死亡的独立危险因素,入院时序贯性脏器功能衰竭(SOFA)评分( $P=0.006$ ,  $OR=1.240$ , 95%  $CI$  1.063~1.446)和合并冠心病( $P=0.037$ ,  $OR=2.834$ , 95%  $CI$  1.066~7.534)为老年SCAP住院死亡的独立危险因素。结论 SCAP患者住院病死率高,入院时PSI评分和有创机械通气为非老年SCAP住院死亡的独立危险因素,入院时SOFA评分和合并冠心病为老年SCAP住院死亡的独立危险因素。

**关键词** 重症社区获得性肺炎; 老年; 病死率; 危险因素; SOFA评分; PSI评分

**中图分类号** R 563.1

**文献标志码** A **文章编号** 1000-1492(2025)03-0558-07

doi: 10.19405/j.cnki.issn1000-1492.2025.03.024

社区获得性肺炎(community-acquired pneumonia, CAP)是世界范围内导致死亡最常见的感染性疾病,重症社区获得性肺炎(severe community-acquired pneumonia, SCAP)是死亡的主要原因<sup>[1]</sup>。尽管治疗理念和干预措施不断优化,重症肺炎30 d病死率仍高达27%<sup>[2]</sup>。早期对SCAP进行预后评估,对指导SCAP的临床治疗及降低病死率具有积极意义。国内一项关于老年重症肺炎的meta分析<sup>[3]</sup>显示,年龄、机械通气、APACHE II评分等因素是影响老年重症肺炎预后的危险因素;欧洲一项研究<sup>[4]</sup>发现,男性和年龄是中重度CAP治疗失败的独立危险因素;巴西一项回顾性队列研究<sup>[5]</sup>发现,有创机械

通气、年龄 $>65$ 岁等是住ICU肺炎患者死亡的危险因素。国内外研究表明,年龄是SCAP死亡的影响因素,但目前尚无针对不同年龄组SCAP预后危险因素分析的研究。因此,该研究根据年龄将SCAP患者分为老年组和非老年组,分析不同年龄组SCAP预后危险因素。

## 1 材料与方法

**1.1 病例资料** 收集2017年12月—2021年10月,河南中医药大学第一附属医院等11家三甲医院呼吸与危重症学科及重症监护室(ICU)的住院SCAP患者的临床资料。纳入标准:①年龄 $\geq 18$ 岁;②诊断标准参照《社区获得性肺炎诊断和治疗指南(2016版)》<sup>[6]</sup>。排除标准:①合并恶性肿瘤;②妊娠及哺乳期妇女;③严重免疫抑制;④真菌肺炎、HIV相关肺囊虫肺炎、肺结核;⑤感染新型冠状病毒肺炎(COVID-19);⑥拒绝签署知情同意书。

## 1.2 方法

**1.2.1 研究类型** 本研究为多中心前瞻性观察性研究。

**1.2.2 资料收集及预后指标** 各中心研究者在观察期间每日对受试者探视,了解受试者病情变化,通

2024-12-17 接收

**基金项目:** 国家自然科学基金项目(编号:82074411、81774222);河南省高校科技创新团队支持计划项目(编号:22IRTSTHN029);河南省中医药科学研究专项课题重大专项项目(编号:2021ZYZD04);河南省中医药拔尖人才培养项目(编号:2019ZYBJ05);河南省中医药科学研究专项课题项目(编号:2022ZYFY04)

**作者简介:** 张康,男,医师;

王海峰,男,博士,教授,博士生导师,通信作者, E-mail: wangh\_f@126.com

过病例报告(case report form, CRF)表对患者每天的资料进行采集和记录,CRF表完成后及时在网络数据平台进行填报,组长单位(河南中医药大学第一附属医院)有专门负责人员每月定期对网络填报数据进行质量控制,同时建立课题实施工作群,每日进行课题实施工作的汇报,对课题实施过程中出现的问题随时在群里提出并讨论解决。资料收集:①基本信息:姓名、性别、年龄、住院前危险因素、合并症等;②入院1 d临床资料:临床体征、重症患者序贯性脏器功能衰竭(sequential organ failure assessment, SOFA)评分、肺炎严重指数(pneumonia severity index, PSI)评分、CURB-65评分、血气分析、病原学检查等;③预后结局指标,主要结局指标:病死率,包括住院病死率、28 d病死率、PSI分级V级(PSI-V)患者病死率、有创机械通气患者病死率、ICU患者病死率;次要结局指标:治疗失败率、器官功能衰竭比例、有创机械通气比例、住院时间等。治疗失败包括早期治疗失败和晚期治疗失败,早期治疗失败定义为72 h内病情恶化(出现休克、需要气管插管,或死亡);晚期治疗失败定义为影像学进展(与入院时比较肺部渗出增加大于50%),持续严重的呼吸衰竭(未有创机械通气的患者氧合指数 $< 26.7$  kPa,呼吸频率 $\geq 30$ 次/min),出现休克、需要气管插管,或于72 h后死亡<sup>[9]</sup>。如上述临床指标在同一天内多次测量,则取最差值。

**1.2.3 研究分组** 根据患者年龄分为老年组(年龄 $\geq 65$ 岁)和非老年组(年龄18~64岁),评估不同年龄组SCAP临床特征和预后;根据住院存活情况分为存活组和死亡组,分析与SCAP住院死亡相关的危险因素。

**1.2.4 伦理及知情同意** 本研究符合赫尔辛基宣言(2013年修订),所有患者均已签署知情同意,本研究经河南中医药大学第一附属医院伦理委员会批准(批号:2017HL-002-01)。

**1.2.5 多中心合作及质量控制** 为保证多中心合作研究的数据质量及伦理,研究开始前组长单位(河南中医药大学第一附属医院)均与各中心签订合作协议书,同时制定《研究者工作手册》,对各中心的课题参加人员进行专门培训,并进行一致性检测。

**1.3 统计学处理** 采用SPSS 20.0统计软件进行数据的统计分析。计数指标用频数和构成比描述,两组疗效比较采用 $\chi^2$ 检验或Fisher精确检验。计量指标用 $\bar{x} \pm s$ 描述,符合正态分布的计量资料两组

疗效比较采用 $t$ 检验,非正态分布的计量资料以采用Mann-Whitney  $U$ 检验。首先对SCAP死亡因素进行单因素分析,对差异有统计学意义的相关因素采用Forward LR逐步法进行多因素Logistic回归分析,确定影响SCAP预后的相关因素。均采用双侧检验, $P < 0.05$ 为差异有统计学意义。

## 2 结果

**2.1 不同年龄段SCAP患者临床特征** 共纳入186例重症肺炎患者,观察中剔除16例,最终对170例SCAP患者进行分析。见图1。其中男性114例(67.1%),年龄20~93( $65.75 \pm 15.23$ )岁,老年患者比例为58.82%(100/170)。与非老年SCAP相比,老年SCAP患者身体质量指数(body mass index, BMI)、体温、呼吸频率更低,合并冠心病、心功能不全比例更高。对病情严重程度评估显示,老年SCAP患者CURB-65评分、PSI评分更高。见表1。

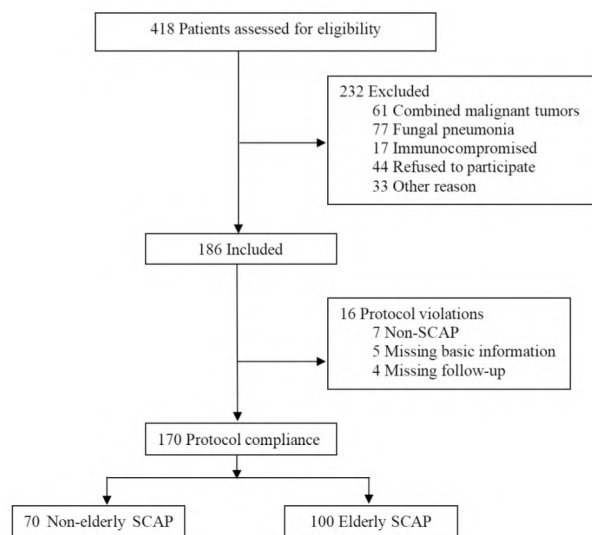


图1 研究流程图

Fig. 1 Research flow diagram

**2.2 不同年龄段SCAP患者病原学检查** 采用痰培养和血培养进行病原学检查。170例患者中仅73例患者检出了病原菌,检出率最高的依次为铜绿假单胞杆菌(19.2%),鲍曼不动杆菌(17.8%),肺炎克雷伯杆菌(15.1%),金黄色葡萄球菌(11.0%)。老年SCAP与非老年SCAP患者病原菌分布比较差异无统计学意义。见表2。

**2.3 不同年龄组SCAP患者预后** SCAP患者住院死亡率为26.5%(45/170),有创机械通气患者病死率最高,为38.6%(34/88)。74例(43.5%)

表1 不同年龄组 SCAP 患者临床特征 [n( % ) ,  $\bar{x} \pm s$  ,  $M( P_{25} , P_{75} )$  ]Tab.1 Clinical characteristics of SCAP patients in different age groups [n( % ) ,  $\bar{x} \pm s$  ,  $M( P_{25} , P_{75} )$  ]

| Characteristics                              | Non-elder <65 years<br>( n = 70 ) | Elder ≥ 65 years<br>( n = 100 ) | N = 170               | $\chi^2 / t / Z$ value | P value |
|----------------------------------------------|-----------------------------------|---------------------------------|-----------------------|------------------------|---------|
| Age                                          | 50.91 ± 11.06                     | 76.14 ± 6.78                    | 65.75 ± 15.23         |                        |         |
| Male                                         | 45( 64.3 )                        | 69( 69.0 )                      | 114( 67.1 )           | 0.414                  | 0.520   |
| BMI( kg/m <sup>2</sup> )                     | 24.0( 22.0, 27.8 )                | 22.0( 20.0, 24.0 )              | 23.0( 21.0, 25.0 )    | -4.291                 | 0.001   |
| Clinical signs                               |                                   |                                 |                       |                        |         |
| Temperature( °C )                            | 37.68 ± 0.96                      | 37.35 ± 0.89                    | 37.49 ± 0.93          | 2.244                  | 0.026   |
| Respiratory rate( breaths/min )              | 25.57 ± 5.74                      | 23.69 ± 6.06                    | 24.46 ± 5.98          | 2.009                  | 0.046   |
| Heart rate( beats/min )                      | 100.77 ± 17.84                    | 102.94 ± 21.26                  | 102.04 ± 19.88        | -0.696                 | 0.488   |
| Systolic blood pressure( mmHg )              | 123.19 ± 20.44                    | 128.88 ± 23.33                  | 126.54 ± 22.30        | -1.647                 | 0.101   |
| Diastolic blood pressure( mmHg )             | 71.42 ± 13.17                     | 70.61 ± 14.44                   | 70.95 ± 13.90         | 0.369                  | 0.713   |
| PaCO <sub>2</sub> ( mmHg )                   | 36.4( 31.65, 43.25 )              | 37.4( 32.75, 46.10 )            | 37.0( 32.35, 43.90 )  | -0.706                 | 0.480   |
| PaO <sub>2</sub> /FiO <sub>2</sub> ( mmHg )  | 176.0( 135.5, 227.0 )             | 182.0( 142.3, 258.0 )           | 181.0( 142.0, 248.0 ) | -1.155                 | 0.248   |
| Pre-hospitalization risk factors             |                                   |                                 |                       |                        |         |
| Received IV antibiotics for the last 30 days | 29( 41.4 )                        | 44( 44.0 )                      | 73( 42.9 )            | 0.111                  | 0.739   |
| Hospitalization ≥ 2 days in the last 90 days | 15( 21.4 )                        | 30( 30.0 )                      | 45( 26.5 )            | 1.554                  | 0.213   |
| Comorbidities                                |                                   |                                 |                       |                        |         |
| Hypertension                                 | 25( 35.7 )                        | 38( 38.0 )                      | 63( 37.1 )            | 0.092                  | 0.761   |
| Cerebrovascular disease                      | 15( 21.4 )                        | 31( 31.0 )                      | 46( 27.1 )            | 1.911                  | 0.167   |
| Diabetes mellitus                            | 17( 24.3 )                        | 28( 28.0 )                      | 45( 26.5 )            | 0.292                  | 0.589   |
| Coronary artery disease                      | 11( 15.7 )                        | 31( 31.0 )                      | 42( 24.7 )            | 5.172                  | 0.023   |
| Cardiac insufficiency                        | 9( 12.9 )                         | 27( 27.0 )                      | 36( 21.2 )            | 4.934                  | 0.026   |
| Severity criteria                            |                                   |                                 |                       |                        |         |
| Confusion                                    | 36( 51.4 )                        | 55( 55.0 )                      | 91( 53.5 )            | 0.211                  | 0.646   |
| Shock state                                  | 9( 12.9 )                         | 22( 22.0 )                      | 31( 18.2 )            | 2.309                  | 0.129   |
| Invasive mechanical ventilation ,            | 39( 55.7 )                        | 49( 49.0 )                      | 88( 51.8 )            | 0.743                  | 0.389   |
| SOFA score                                   | 5.88 ± 3.50                       | 5.62 ± 3.11                     | 5.73 ± 3.27           | -0.269                 | 0.788   |
| CURB-65 score                                | 1.46 ± 1.00                       | 2.45 ± 0.95                     | 2.04 ± 1.08           | -5.730                 | 0.001   |
| PSI score                                    | 99.43 ± 39.40                     | 128.75 ± 32.64                  | 116.68 ± 38.30        | -5.289                 | 0.001   |
| PSI risk class <sup>a</sup>                  |                                   |                                 |                       |                        |         |
| I - III                                      | 29( 41.4 )                        | 13( 13.0 )                      | 42( 24.7 )            | 17.889                 | 0.001   |
| IV                                           | 23( 32.9 )                        | 45( 45.0 )                      | 68( 40.0 )            | 2.530                  | 0.112   |
| V                                            | 18( 25.7 )                        | 42( 42.0 )                      | 60( 35.3 )            | 4.782                  | 0.029   |

<sup>a</sup>: Risk classes I - III ( ≤ 90 points ) , risk class IV ( 91 - 130 points ) , risk class V ( > 130 points ) .

表2 不同年龄组 SCAP 患者病原学检查 [n( % ) ]

Tab.2 Microbiologic identification of SCAP patients in different age groups [n( % ) ]

| Microbiologic                       | Non-elder <65 years<br>( n = 30 ) | Elder ≥ 65 years<br>( n = 43 ) | N = 73      | $\chi^2$ value | P value |
|-------------------------------------|-----------------------------------|--------------------------------|-------------|----------------|---------|
| <i>Gram-negative bacteria</i>       |                                   |                                |             |                |         |
| <i>Pseudomonas aeruginosa</i>       | 3 ( 10.0 )                        | 11 ( 25.6 )                    | 14 ( 19.2 ) | 2.768          | 0.096   |
| <i>Acinetobacter baumannii</i>      | 7 ( 23.3 )                        | 6 ( 14.0 )                     | 13 ( 17.8 ) | 1.062          | 0.303   |
| <i>Klebsiella pneumoniae</i>        | 5 ( 16.7 )                        | 6 ( 14.0 )                     | 11 ( 15.1 ) | 0.102          | 0.752   |
| Other <i>Gram-negative bacteria</i> | 8 ( 26.7 )                        | 16 ( 37.2 )                    | 24 ( 32.9 ) | 0.890          | 0.345   |
| <i>Gram-positive bacteria</i>       |                                   |                                |             |                |         |
| <i>Staphylococcus aureus</i>        | 4 ( 13.3 )                        | 4 ( 9.3 )                      | 8 ( 11.0 )  | 0.294          | 0.588   |
| Other <i>Gram-positive bacteria</i> | 10 ( 33.3 )                       | 12 ( 27.9 )                    | 22 ( 30.1 ) | 0.247          | 0.619   |

SCAP 患者合并了至少一种呼吸系统以外的脏器功能衰竭。老年 SCAP 与非老年 SCAP 患者预后差异无统计学意义。见表 3。

#### 2.4 非老年 SCAP 患者住院死亡危险因素分析

对非老年 SCAP 住院死亡的危险因素进行单因素分析,显示意识障碍、有创机械通气、SOFA 评分、CURB-65 评分、PSI 评分,死亡组与存活组比较差异有统计学意义。将住院死亡与否作为因变量,将上

述因素作为自变量进行多因素 Logistic 回归分析。结果显示入院第一天的重症患者 PSI 评分、有创机械通气为非老年 SCAP 住院死亡的独立影响因素。见表 4。

**2.5 老年 SCAP 患者住院死亡危险因素分析** 对老年 SCAP 死亡的危险因素进行单因素分析显示,两组重症患者 SOFA 评分、CURB-65 评分、休克、意识障碍、合并冠心病、合并心功能不全比较差异有统计学意义。将住院死亡与否作为因变量,将上述因

素作为自变量进行多因素 Logistic 回归分析显示,入院第一天的重症患者 SOFA 评分、合并冠心病为老年 SCAP 死亡的独立影响因素。见表 5。

### 3 讨论

这项前瞻性、多中心、观察性研究显示,非老年 SCAP 住院病死率为 24.3%,老年 SCAP 住院病死率为 28.0%;入院时 PSI 评分和有创机械通气为非老年 SCAP 住院死亡的独立危险因素,入院时 SOFA

表 3 不同年龄组 SCAP 患者预后 [n(%)]

Tab.3 Prognosis of SCAP patients in different age groups [n(%)]

| Outcomes                                                 | Non-elder <65 years<br>(n = 70) | Elder ≥65 years<br>(n = 100) | n = 170    | $\chi^2 / Z$ value | P value |
|----------------------------------------------------------|---------------------------------|------------------------------|------------|--------------------|---------|
| Primary Clinical Outcome                                 |                                 |                              |            |                    |         |
| In-hospital mortality,                                   | 17 (24.3)                       | 28 (28.0)                    | 45 (26.5)  | 0.292              | 0.589   |
| 28-day mortality                                         | 15 (21.4)                       | 23 (23.0)                    | 38 (22.4)  | 0.059              | 0.809   |
| Mortality in PSI-V <sup>a</sup>                          | 8 (44.4)                        | 14 (33.3)                    | 22 (36.7)  | 0.670              | 0.413   |
| Mortality in ivasive mechanical ventilation <sup>b</sup> | 14 (35.9)                       | 20 (40.8)                    | 34 (38.6)  | 0.222              | 0.638   |
| Mortality in ICU-SCAP <sup>c</sup>                       | 14 (28.6)                       | 24 (38.7)                    | 38 (34.2)  | 1.249              | 0.264   |
| Secondary Outcomes                                       |                                 |                              |            |                    |         |
| Treatment failure                                        | 22 (36.7)                       | 41 (41.0)                    | 63 (39.4)  | 0.295              | 0.587   |
| Organ failure                                            | 26 (37.1)                       | 48 (48.0)                    | 74 (43.5)  | 1.975              | 0.160   |
| Circulatory system failure                               | 13 (18.6)                       | 28 (28.0)                    | 41 (24.1)  | 2.000              | 0.157   |
| Renal failure                                            | 5 (7.1)                         | 13 (13.0)                    | 18 (10.6)  | 1.492              | 0.222   |
| Liver failure                                            | 8 (11.4)                        | 7 (7.0)                      | 15 (8.8)   | 1.004              | 0.316   |
| Length of stay (day,IQR)                                 | 15 (12, 23)                     | 15 (9, 24)                   | 15 (9, 24) | -0.557             | 0.578   |

<sup>a</sup>: Mortality in SCAP with PSI classes V,  $n_{\text{non-elder}} = 18$ ,  $n_{\text{elder}} = 42$ ; <sup>b</sup>: Mortality in SCAP with ivasive mechanical ventilation,  $n_{\text{non-elder}} = 39$ ,  $n_{\text{elder}} = 49$ ; <sup>c</sup>: Mortality in SCAP admitted to the ICU,  $n_{\text{non-elder}} = 49$ ,  $n_{\text{elder}} = 62$ .

表 4 非老年 SCAP 患者住院死亡危险因素分析

Tab.4 Univariate and multivariate analysis of variables associated with in-hospital mortality of non-elderly patients with SCAP

| Factor                          | Univariate analysis |                |         | Multivariate analysis |                |         |
|---------------------------------|---------------------|----------------|---------|-----------------------|----------------|---------|
|                                 | Exp (B)             | 95% CI         | P value | Exp (B)               | 95% CI         | P value |
| PSI score                       | 1.024               | 1.007 - 1.042  | 0.006   | 1.022                 | 1.004 - 1.041  | 0.016   |
| Invasive mechanical ventilation | 5.227               | 1.343 - 20.335 | 0.017   | 4.543                 | 1.092 - 18.898 | 0.037   |
| SOFA score                      | 1.178               | 1.006 - 1.380  | 0.042   |                       |                |         |
| Confusion                       | 4.239               | 1.220 - 14.728 | 0.023   |                       |                |         |
| CURB-65 score                   | 4.239               | 1.220 - 14.728 | 0.023   |                       |                |         |

表 5 老年 SCAP 患者住院死亡危险因素分析

Tab.5 Univariate and multivariate analysis of variables associated with in-hospital mortality of elderly patients with SCAP

| Factor                                | Univariate analysis |               |         | Multivariate analysis |               |         |
|---------------------------------------|---------------------|---------------|---------|-----------------------|---------------|---------|
|                                       | Exp(B)              | 95% CI        | P value | Exp(B)                | 95% CI        | P value |
| Combined with Coronary artery disease | 3.235               | 1.291 - 8.110 | 0.012   | 2.834                 | 1.066 - 7.534 | 0.037   |
| Combined with Cardiac insufficiency   | 2.850               | 1.113 - 7.296 | 0.029   |                       |               |         |
| Shock state                           | 2.731               | 1.014 - 7.361 | 0.047   |                       |               |         |
| Confusion                             | 2.643               | 1.031 - 6.774 | 0.043   |                       |               |         |
| SOFA score                            | 1.238               | 1.065 - 1.439 | 0.005   | 1.240                 | 1.063 - 1.446 | 0.006   |
| CURB-65 score                         | 1.723               | 1.055 - 2.814 | 0.030   |                       |               |         |

评分和合并冠心病为老年 SCAP 住院死亡的独立危险因素。

老年人群因为生理机能减退和组织器官衰老,免疫力低下,并发症较多,疾病进展迅速,病情复杂,与非老年患者在病理生理等方面有较大差别<sup>[8]</sup>。研究结果显示,与非老年 SCAP 相比,老年 SCAP 入院时 PSI 评分和 CURB-65 评分更高,合并冠心病和心功能不全比例更高。但临床体征方面,老年 SCAP 患者入院时发热、呼吸频率增快等症状表现更不典型,提示老年 SCAP 病情较重,但症状不典型,这与既往研究<sup>[8]</sup>结论一致。因此密切关注老年 SCAP 患者病情变化,早期对老年 SCAP 病情严重程度和死亡风险进行评估具有积极意义。

本研究中,SOFA 评分是老年 SCAP 患者住院死亡的独立影响因素。SOFA 包括了 6 个不同的系统的评分,反映器官功能衰竭程度<sup>[14]</sup>。既往多项研究<sup>[11]</sup>发现,SOFA 评分对老年 SCAP 住院死亡有很好的预测价值。近年来 SOFA 评分被越来越多地应用于临床指导重症患者的病情评估,与其他预后评估工具相比,SOFA 评分对重症患者的死亡风险预后价值更高<sup>[12]</sup>。合并冠心病是老年 SCAP 的独立危险因素。2013 年中国第五次卫生服务调查显示成年人冠心病患病率为 10.2%,而 60 岁以上人群冠心病患病率为 27.8%<sup>[13]</sup>。SCAP 主要的病理生理机制是感染导致的全身炎症反应综合征,炎症反应过程中释放的大量炎症因子可以导致心肌损伤,从而加重心脏负荷,而合并冠心病的老年患者心脏功能较差,容易出现病情的迅速进展,导致心肺功能衰竭<sup>[14-15]</sup>。研究<sup>[16]</sup>发现,COVID-19 重症患者多合并心血管疾病,COVID-19 死亡患者中,35% (14/40) 的患者伴有心肌细胞的坏死。

本研究采用多中心前瞻性观察性的研究方法,将 SCAP 患者分为老年人群和非老年人群,对比分析不同年龄段的 SCAP 患者临床特征,同时采用 Logistic 分析,确定与非老年 SCAP 患者和老年 SCAP 患者死亡相关的危险因素。但本研究也存在一定的局限性。首先,本研究纳入病例既有普通病房患者,又有 ICU 患者,不同护理单元患者病情严重程度及治疗方案可能存在一定差异,因此纳入患者可能存在一定偏倚。其次,这是一项多中心研究,不同医院的临床医师可能根据他们的经验做出不同的临床决定,因此西医常规治疗可能存在一定差别。最后,本研究病例数相对较少,且仅观察住院期间的病死率,因此在分析生存相关影响因素时可能外推性较为局

限。

综上,SCAP 患者中老年患者比例较高,与非老年 SCAP 患者相比,老年 SCAP 患者入院时病情严重程度更高,并发症更多,但入院临床症状表现更不明显。SCAP 住院病死率高,入院时 PSI 评分和有创机械通气为非老年 SCAP 住院死亡的独立危险因素,入院时 SOFA 评分和合并冠心病为老年 SCAP 住院死亡的独立危险因素。今后可开展大样本、高质量的临床研究,验证针对 SCAP 患者有创机械通气和合并冠心病的保护性干预措施是否可以使 SCAP 患者获益。

## 参考文献

- [1] Torres A, Cilloniz C, Niederman M S, et al. Pneumonia [J]. Nat Rev Dis Primers, 2021, 7(1): 25. doi: 10.1038/s41572-021-00259-0.
- [2] Cavallazzi R, Furmanek S, Arnold F W, et al. The burden of community-acquired pneumonia requiring admission to ICU in the United States [J]. Chest, 2020, 158(3): 1008-16. doi: 10.1016/j.chest.2020.03.051.
- [3] 朱海燕, 张艳, 陈淑琴. 老年重症肺炎患者预后影响因素的 meta 分析 [J]. 实用预防医学, 2020, 27(3): 358-61.
- [4] Zhu H Y, Zhang Y, Chen S Q. Meta analysis of prognostic influencing factors in elderly patients with severe pneumonia [J]. Pract Prev Med, 2020, 27(3): 358-61.
- [5] Dinh A, Duran C, Ropers J, et al. Factors associated with treatment failure in moderately severe community-acquired pneumonia: A secondary analysis of a randomized clinical trial [J]. JAMA Netw Open, 2021, 4(10): e2129566. doi: 10.1001/jamanet-workopen.2021.29566.
- [6] Espinoza R, Silva J R L E, Bergmann A, et al. Factors associated with mortality in severe community-acquired pneumonia: A multicenter cohort study [J]. J Crit Care, 2019, 50: 82-6. doi: 10.1016/j.jcrc.2018.11.024.
- [7] 中华医学会呼吸病学分会. 中国成人社区获得性肺炎诊断和治疗指南(2016 年版) [J]. 中华结核和呼吸杂志, 2016, 39(4): 253-79. doi: 10.3760/cma.j.issn.1001-0939.2016.04.005.
- [8] Chinese Society of Respiratory Diseases. Guidelines for the diagnosis and treatment of community-acquired pneumonia in adults in China (2016 edition) [J]. Chin J Tuberc Respir Dis, 2016, 39(4): 253-279. doi: 10.3760/cma.j.issn.1001-0939.2016.04.005.
- [9] Torres A, Sibila O, Ferrer M, et al. Effect of corticosteroids on treatment failure among hospitalized patients with severe community-acquired pneumonia and high inflammatory response: A randomized clinical trial [J]. JAMA, 2015, 313(7): 677-86. doi: 10.1001/jama.2015.88.
- [10] Han S, Budinger G R S, Gottardi C J. Alveolar epithelial regeneration in the aging lung [J]. J Clin Invest, 2023, 133(20):

- e170504. doi: 10.1172/JCI170504.
- [9] Cillóniz C, Domínguez C, Pericás J M, et al. Community-acquired pneumonia in critically ill very old patients: A growing problem [J]. *Eur Respir Rev*, 2020, 29(155): 190126. doi: 10.1183/16000617.0126-2019.
- [10] Lambden S, Laterre P F, Levy M M, et al. The SOFA score—development, utility and challenges of accurate assessment in clinical trials [J]. *Crit Care*, 2019, 23(1): 374. doi: 10.1186/s13054-019-2663-7.
- [11] Baek M S, Park S, Choi J H, et al. Mortality and prognostic prediction in very elderly patients with severe pneumonia [J]. *J Intensive Care Med*, 2020, 35(12): 1405-10. doi: 10.1177/0885066619826045.
- [12] 张康, 姬文帅, 孔欣欣, 等. 序贯性脏器功能衰竭评分和CURB-65评分及肺炎严重指数评分对重症肺炎患者28天死亡的预测效能比较研究 [J]. *中国全科医学*, 2023, 26(18): 2217-22, 2226. doi: 10.12114/j.issn.1007-9572.2022.0880.
- [12] Zhang K, Ji W S, Kong X X, et al. Predictive efficacies of SOFA score, CURB-65 score and PSI score for 28-day mortality in patients with severe pneumonia: A comparative study [J]. *Chin Gen Pract*, 2023, 26(18): 2217-22, 2226. doi: 10.12114/j.issn.1007-9572.2022.0880.
- [13] 国家心血管病中心. 中国心血管健康与疾病报告2019 [J]. *心肺血管病杂志*, 2020, 39(10): 1157-62. doi: 10.3969/j.issn.1007-5062.2020.10.001.
- [13] National Cardiovascular Center. Annual report on cardiovascular health and diseases in China 2019 [J]. *J Cardiovasc Pulm Dis*, 2020, 39(10): 1157-62. doi: 10.3969/j.issn.1007-5062.2020.10.001.
- [14] Brown A O, Millett E R, Quint J K, et al. Cardiotoxicity during invasive pneumococcal disease [J]. *Am J Respir Crit Care Med*, 2015, 191(7): 739-45. doi: 10.1164/rccm.201411-1951PP.
- [15] Bergh C, Fall K, Udumyan R, et al. Severe infections and subsequent delayed cardiovascular disease [J]. *Eur J Prev Cardiol*, 2017, 24(18): 1958-66. doi: 10.1177/2047487317724009.
- [16] Pellegrini D, Kawakami R, Guagliumi G, et al. Microthrombi as a major cause of cardiac injury in COVID-19: a pathologic study [J]. *Circulation*, 2021, 143(10): 1031-42. doi: 10.1161/CIRCULATIONAHA.120.051828.

## The risk factors of prognosis in patients with severe community-acquired pneumonia in different age groups

Zhang Kang<sup>1,2,3</sup>, Yang Hao<sup>2</sup>, Jing Hui<sup>2</sup>, Guan Shengnan<sup>2</sup>, Zhang Qing<sup>2</sup>, Xie Kai<sup>1,2,3</sup>, Wang Haifeng<sup>1,2,3</sup>

(<sup>1</sup>Dept of Respiratory and Critical Care Medicine, The First Affiliated Hospital of Henan University of Chinese Medicine, Zhengzhou 450000; <sup>2</sup>The First Clinical Medical College, Henan University of Chinese Medicine, Zhengzhou 450003; <sup>3</sup>Co-Construction Collaborative Innovation Center for Chinese Medicine and Respiratory Diseases by Henan & Education Ministry of China, Zhengzhou 450003)

**Abstract Objective** To explore the risk factors of prognosis in patients with severe community-acquired pneumonia (SCAP) in different age groups. **Methods** A multi-center and prospective study was conducted at 11 teaching hospitals in China from December 2017 to October 2021. Patients who met the criteria were assigned to the elderly group ( $\geq 65$  years) and the non-elderly group (18-64 years) to demonstrate the clinical characteristics of SCAP. Patients were divided into survival group and death group according to whether they died in hospital, to determine the risk factors associated with mortality by multivariate logistic regression analysis. **Results** A total of 170 patients with SCAP were included in the study. The age of SCAP was 20-93 ( $65.75 \pm 15.23$ ) years old, and the proportion of SCAP in the elderly was 58.82% (100/170). In-hospital mortality of non-elderly SCAP was 24.3% (17/70), and the in-hospital mortality of elderly SCAP was 28% (28/100). Compared with non-elderly group, patients in elderly group had higher severity score and more complications on admission, but the symptoms of fever and respiratory rate at admission were less obvious. In multivariable logistic regression analysis, the factors significantly associated with in-hospital mortality of non-elderly SCAP were pneumonia severity index (PSI) score ( $P = 0.016$ ,  $OR = 1.022$ , 95%  $CI$  1.004-1.041) and invasive mechanical ventilation ( $P = 0.037$ ,  $OR = 4.543$ , 95%  $CI$  1.092-18.898) on admission, and the risk factors associated with in-hospital mortality in elderly SCAP were sequential organ failure assessment (SOFA) score ( $P = 0.006$ ,  $OR = 1.240$ , 95%  $CI$  1.063-1.446) and combined with coronary artery disease on admission ( $P = 0.037$ ,  $OR = 2.834$ , 95%  $CI$  1.066-7.534). **Conclusion** In-hospital mortality for SCAP is high. PSI score and invasive mechanical ventilation are risk factors for in-hospital

tal mortality of non-elderly patients with SCAP, and SOFA score and combined with coronary artery disease on admission are risk factors for in-hospital mortality of elderly patients with SCAP.

**Key words** severe community-acquired pneumonia; aged; mortality; risk factors; SOFA score; PSI score

**Fund programs** National Natural Science Foundation of China (Nos. 82074411, 81774222); Science and Technology Innovation Team Support Program for Universities in Henan Province (No. 22IRTSTHN029); Major Program of Traditional Chinese Medicine Scientific Research of Henan Province (No. 2021ZYD04); Traditional Chinese Medicine Scientific Research Program of Henan Province (No. 2019ZYBJ05); Outstanding Talent Training Program of Traditional Chinese Medicine of Henan Province (No. 2022ZYFY04)

**Corresponding author** Wang Haifeng, E-mail: wang\_h\_f@126.com

## (上接第 557 页)

- [1] Su J, Cui L, Yang W, et al. Baseline high-sensitivity C-reactive protein predicts the risk of incident ankylosing spondylitis: results of a community-based prospective study [J]. *PLoS One*, 2019, 14(2): e0211946. doi:10.1371/journal.pone.0211946.
- [2] Göbel K, Eichler S, Wiendl H, et al. The coagulation factors fibrinogen, thrombin, and factor XII in inflammatory disorders—a systematic review [J]. *Front Immunol*, 2018, 9: 1731. doi:10.3389/fimmu.2018.01731.
- [3] Kim J W, Jung J Y, Suh C H, et al. Systemic immune-inflammation index combined with ferritin can serve as a reliable assessment score for adult-onset Still's disease [J]. *Clin Rheumatol*, 2021, 40(2): 661–8. doi:10.1007/s10067-020-05266-2.
- [4] Tanacan E, Dincer D, Erdogan F G, et al. A cutoff value for the systemic immune-inflammation index in determining activity of Behçet disease [J]. *Clin Exp Dermatol*, 2021, 46(2): 286–91. doi:10.1111/ced.14432.
- [5] Ahn S S, Yoon T, Song J J, et al. Serum albumin, prealbumin, and ischemia-modified albumin levels in patients with ANCA-associated vasculitis: a prospective cohort study [J]. *PLoS One*, 2022, 17(7): e0271055. doi:10.1371/journal.pone.0271055.

## The laboratory biomarkers of disease activity in ankylosing spondylitis

Gao Siming, Liu Wei, Man Siliang, Li Hongchao, Song Hui

(Dept of Rheumatology, Beijing Jishuitan Hospital, Capital Medical University, Beijing 100010)

**Abstract Objective** To analyze the correlation between different laboratory biomarkers and disease activity in ankylosing spondylitis and to compare their specificity and sensitivity in assessing disease activity. **Methods** Spearman correlation or Pearson correlation was used to analyze the correlation between disease activity and laboratory biomarkers. Receiver operating characteristic (ROC) was used to compare the sensitivity and specificity of each laboratory biomarker in evaluating disease activity. **Results** Hypersensitive C-reactive protein, fibrinogen, D-dimer, erythrocyte sediment rate, C-reactive protein, immuno-inflammatory index (platelet count  $\times$  neutrophil count/lymphocyte count), fibrinogen/albumin ratio, albumin and pro-albumin were correlated with disease activity. The ratio of fibrinogen to albumin, fibrinogen, erythrocyte sedimentation rate, immuno-inflammatory index, C-reactive protein and hypersensitive C-reactive protein had good values in determining the disease activity. **Conclusion** Different laboratory biomarkers are correlated with the disease activity of ankylosing spondylitis, and some of them have better discriminating values for the disease activity.

**Key words** ankylosing spondylitis; disease activity; laboratory biomarkers; specificity; sensibility

**Fund programs** National Natural Science Foundation of China (No. 81901668); Beijing Jishuitan Hospital Nova Program (No. XKXX-202112)

**Corresponding author** Song Hui, E-mail: jstyysmyk@163.com