

Need Analysis of Indian Critical Health Care Delivery in Government Sectors and Its Impact on the General Public: A Time to Revamp Public Health Care Infrastructure

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ABSTRACT

Background: Poverty is directly linked to public health care delivery in many ways and dimensions. Every aspect of the human sphere is preplanned, but a health crisis is the only emergency which pushes humanity into severe economic stress. Therefore, every nation aims to safeguard its citizens from a health crisis. In this aspect, India needs to improve its public health infrastructure in order to protect its citizens and save them from poverty.

Objectives: (1) To assess the current pitfalls in public critical health care delivery, (2) to analyze whether the health care delivery matches the requirements of its population in every state, (3) to produce solutions and guidelines to overcome the stress in this priority area.

Materials and methods: Data regarding the critical care workforce, which includes critical care doctors and nurses, were taken from official websites and other sources. Critical care infrastructure data were retrieved from the Internet sources. Data were validated by consulting state government sources and cross-checked for bias elimination. The data were analyzed using the “Statistical Package for Social Sciences” software version 20, and were presented using descriptive statistics.

Results: There is a 1:10 percentage of deficit in the case of critical care workforce and infrastructure when compared with its need analysis. Critical care medicine specialists are in 1:75 when compared to other specialties.

Conclusion: Overall, the public sector critical care needs a total boost through out of box solutions. According to the Stockholm International Peace Research Institute (SIPRI), India spent the third most on defense in the world in 2021. India spent 76.6 billion dollars on its military in 2021, up 33% from 2012 and 0.9% from 2020. However, since India is considered a fast-growing economy, there is still a huge disparity in critical care. Without resetting critical health care, India cannot grow in welfare indices even if it is among the top gross domestic product (GDP) countries.

Keywords: Critical care, Critical care doctors, Critical care nurses, Human resources, ICU beds, Infrastructure, Manpower, Medicines, Ventilators.

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INTRODUCTION

The critical care unit or intensive care unit (ICU) plays a pivotal role in saving an individual's life from a health crisis. This care is given to critically ill patients with specialized equipment and physicians. But the critical health care facilities are not uniformly available around the globe. There are still no international standards or norms on the number of ICUs. Units are required for a fixed population. Even in places where ICUs are present, the care turns out to be very costly and unaffordable to most of the general population. The exorbitant cost of establishing and maintaining an ICU is due to the cost involved in establishing and preserving high-end gadgets and instruments involved in the care. The second reason is the high demand for trained health professionals like ICU specialist physicians and nurses. The basic requirements of a population, such as food, shelter, and clothing are attainable through hard work, but most people are driven down to poverty only during a health crisis. Even in a health crisis, most noncritical support has been well cared for by most health professionals. But intensive care needs to function exorbitantly when it comes to severe health crises like pandemics or during health emergencies. In developing countries like India, where medical care is supposed to be better than in third-world countries, intensive care costs around 300–900 US dollars per day.¹ Based on the methodology provided by the Tendulkar committee in 2005, the national

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poverty level between 2011 and 2012 was 21.9%.² According to the International Monetary Fund's World Economic Outlook report, India's average per capita income in 2021 is the US \$2191. So, during a health crisis, the excessive charges of ICU can withstand a person's average per capita income just for a few days. Secondly, even those affordable people could not get admission to ICUs due to the scarcity of facilities. This problem is due to the shortage of intensive care beds for a stipulated population that is so wide. Third, the number of intensive care physicians and nurses to take care of the intensive care infrastructure was lacking in the world's

second most populous country. This investigative paper aims to find out the current status of ICUs available in India and suggests a base to reset a health system toward achieving self-sustainability even during any emergency like pandemic situations arising in the future.

MATERIALS AND METHODS

The study design comprises of analytical retrospective methodology. The data regarding intensive care were derived from official websites like the “Indian Society of Critical Care Medicine (ISCCM)”. Current data and the status were also derived from publications in scientific journals. State-wise availability of ICU beds and ventilators are categorized into better, average, and below-average groups. Data regarding the critical care workforce, which includes critical care doctors and nurses, were taken from official websites and other sources. This critical care workforce is tabulated from the highest to the lowest availability of seat intake by the states. Critical care infrastructure data were retrieved from the Internet sources. The equipment required for the 12-bedded ICU was categorized based on their costs, such as above 1 lakh, ranging between Rs 10,000 and 1 lakh, and below rupees 10,000. Data were validated by consulting state government sources and cross-checked for bias elimination. The data were analyzed using the “Statistical Package for Social Sciences” software version 20, and were presented using descriptive statistics.

RESULTS

Table 1 depicts the estimated number of ICU beds and ventilators in the public and private sectors. Tripura has the highest ICU beds in the public sector, with 221 (94.84%), while Daman and Diu has the least, with 12 (19.04%).

Table 2 represents the total no of “ICU beds” available in the public (high to low availability) and private sectors are proportionate to the state population. The frequency of 0.001% represents the low availability of “ICU beds” in Chhattisgarh, while the frequency of 0.032% (Punjab) means the highest availability of “ICU beds” in the public sector.

Table 3 represents the total number of ventilators in the public (high to low availability) and private sectors in proportion to the state population. The frequency of 0.0002% (Bihar) represents low availability, while the frequency of 0.012% (Lakshadweep) means the highest availability of ventilators in the public sector.

Table 4 represents the high to low state-wise availability of seats for NPCC program. In India, Karnataka has the highest annual intake of seats for the NPCC.

Table 5 depicts the high to low state-wise availability of seats for DM critical care medicine. Uttarakhand has the highest number of seats (10).

Table 6 represents the Indian diploma in critical care medicine accredited institutions and their annual intake of seats, from high to low. Maharashtra (135) has the highest yearly intake.

Table 7 represents the equipment required for the 12-bedded ICU. The cost for 12-bedded ICU is seven crores sixty-four lakhs twenty-four thousand nine hundred and sixty-six rupees. Therefore, high-cost instruments for ICU is around seven crores, sixty lakhs six hundred and fourteen rupees (7,60,00,614).

DISCUSSION

The ICU is a highly specialized and advanced hospital area that is dedicated to managing critically ill patients, injuries, or

complications. It is specifically designed, staffed, located, furnished, and equipped. A committed medical, nursing, and allied staff are employed in this department. It functions according to established policies, and its protocols and practices ought to have quality assurance, education, training, and research programs. It can no longer be considered solely as a component of anesthesia, medicine, surgery, or any other specialty because it is quickly becoming a distinct specialty. It must have a separate group of medical professionals, nurses, and other staff members who are familiar with the necessary specialties.

Inference by this article is that the reason for high-cost expenditure in “Intensive care unit” in India is scarcity of human resources, both the nurses and doctors; this is under the statement given by Dr Shiva Kumar Iyer, President (2014–2016) ISCCM that the high cost is also because ICUs need more nurses (at a ratio of 1:1–1:3) as well as doctors (1:8–1:10).⁹ This finding also coincides with our study finding that there is the least availability of annual intake of seats for the DM critical care medicine, diploma courses for critical care medicine and critical care nurse practitioners. According to the data from the various recognized websites, the total number of annual seats intake for the nursing practitioner in critical care programs is 435 (four hundred and thirty-five), out of which Karnataka has the highest number of seats, i.e., 135 and the least availability (i.e., 10) states for the critical care nurses are Puducherry, Andhra Pradesh, Assam, Madhya Pradesh, and West Bengal. In India, the total number of seats available for the DM in critical care is 54. The highest intake of seats for DM critical care medicine is 10 in the Uttarakhand state, with a population density of 11.09 million. Though Uttarakhand has the highest intake when compared to other states, it is not sufficient to meet the population critical care doctor’s criteria given by ISCCM (i.e., 1:8–1:10). The least annual intake of seats (i.e., 2) is in Punjab, Andhra Pradesh, Odisha, West Bengal, and Puducherry. There are also ISCCM accredited diploma courses in critical care medicine. All over India, the annual intake of seats for the ISCCM accredited diploma course in critical care medicine is 622.^{6,7} Highest diploma courses in critical care medicine available state is Maharashtra (i.e., 135) and the least is Punjab (i.e., 12). Maharashtra, with a population of 12.57 crores, is India’s most economically progressive state, with a gross domestic product (GDP) value of \$390 million in 2018–2019, which shares around 15%.¹⁰ But the state is not advanced in its critical health care sector. States with a low annual intake of seats should increase the number of seats enormously for the doctors and nurses to compensate for the gaps and prevent crisis during pandemics. With 1.3 billion inhabitants, India is one of the most densely populated nations in the world, with 382 inhabitants per square kilometre.¹¹ Currently, there is one doctor for every 1,457 citizens in India (WHO target 1:1000).¹² There are 12,046 members of the ISCCM registered, though it is unknown how many doctors in India have received intensive care training (including trainees).⁸ In contrast to other states, which have fewer than 50 members, Maharashtra has a higher representation (2,944 members), making up a portion of the membership that is not evenly distributed. Similar limitations apply to nursing capacity, and there are significant shortages of qualified critical care nurses.¹³ Some state governments have started training non-ICU health care workers as a result of the shortage of qualified critical care physicians and nurses. In the first phase of a critical care training course, Thiruvananthapuram, a district in Kerala, was able to train as many as 320 doctors and 180 nurses.¹⁴ The state governments should also consider the issue and add more seats for critical

Table 1: Estimated percentage of ICU beds and ventilators in India's public and private sectors

| <i>Name of the state or union territory</i> | <i>Estimated ICU beds in the public sector n (%)³</i> | <i>Estimated ICU beds in the private sector n (%)³</i> | <i>Estimated ventilators in the public sector n (%)³</i> | <i>Estimated ventilators in the private sector n (%)³</i> |
|---|--|---|---|--|
| Tripura | 221 (94.84) | 12 (5.15) | 111 (94.87) | 6 (35.29) |
| Arunachal Pradesh | 120 (91.60) | 11 (8.39) | 60 (90.90) | 6 (9.09) |
| Jammu and Kashmir | 365 (91.25) | 35 (8.75) | 182 (91) | 18 (9) |
| Meghalaya | 223 (85.11) | 39 (14.88) | 111 (84.73) | 20 (15.26) |
| Andaman and Nicobar Islands | 54 (83.07) | 11 (16.9) | 27 (84.37) | 5 (15.62) |
| Mizoram | 100 (80) | 25 (20) | 50 (80.64) | 12 (19.35) |
| Sikkim | 78 (79.59) | 20 (20.40) | 39 (79.59) | 10 (20.40) |
| Manipur | 71 (78.88) | 18 (20) | 36 (80) | 9 (20) |
| Himachal Pradesh | 620 (77.30) | 182 (22.69) | 310 (77.30) | 91 (22.69) |
| Nagaland | 94 (73.43) | 34 (26.56) | 47 (73.43) | 17 (26.56) |
| Odisha | 926 (72.23) | 357 (27.84) | 463 (72.23) | 178 (27.76) |
| Lakshadweep | 15 (71.4) | 6 (28.57) | 8 (72.72) | 3 (27.27) |
| Assam | 857 (70.88) | 352 (29.11) | 429 (71.02) | 176 (29.13) |
| West Bengal | 3,928 (69.19) | 1,748 (30.79) | 1,964 (69.20) | 874 (30.79) |
| Puducherry | 178 (68.7) | 80 (30.88) | 89 (68.99) | 40 (31.00) |
| Chandigarh | 188 (66.66) | 94 (32.98) | 94 (66.66) | 47 (33.33) |
| Dadra and Nagar Haveli | 31 (65.95) | 16 (34.04) | 15 (62.5) | 8 (33.33) |
| Goa | 151 (65.93) | 79 (34.49) | 75 (65.21) | 39 (33.91) |
| Delhi | 1,219 (61.78) | 754 (38.21) | 610 (61.86) | 377 (38.23) |
| Chhattisgarh | 471 (54.07) | 401 (46.03) | 235 (53.89) | 200 (45.87) |
| Rajasthan | 2,353 (50.50) | 2,306 (49.49) | 1,176 (50.49) | 1,153 (49.50) |
| Tamil Nadu | 3,877 (49.90) | 3,892 (50.09) | 1,938 (49.89) | 1,946 (50.10) |
| Madhya Pradesh | 1,555 (47.89) | 1,692 (52.10) | 778 (47.93) | 846 (52.12) |
| Jharkhand | 539 (40.67) | 786 (59.32) | 270 (40.78) | 393 (59.36) |
| Kerala | 1,900 (38.29) | 3,061 (61.70) | 950 (38.29) | 1,531 (61.28) |
| Bihar | 583 (37.78) | 960 (62.21) | 292 (37.87) | 480 (62.25) |
| Uttarakhand | 426 (35.73) | 767 (64.34) | 213 (35.73) | 383 (64.26) |
| Gujarat | 1,009 (31.11) | 2,234 (68.88) | 504 (31.07) | 1,117 (68.86) |
| Haryana | 562 (31.10) | 1,245 (68.89) | 281 (31.08) | 623 (68.91) |
| Punjab | 897 (29.40) | 2,153 (70.59) | 448 (29.37) | 1,077 (70.62) |
| Uttar Pradesh | 3,813 (27.10) | 10,257 (72.89) | 1,907 (27.10) | 5,129 (72.90) |
| Andhra Pradesh | 1,157 (27.7) | 3,005 (72.20) | 578 (27.77) | 1,502 (72.17) |
| Karnataka | 3,486 (26.60) | 9,619 (73.39) | 1,743 (26.59) | 4,810 (73.40) |
| Maharashtra | 2,572 (22.1) | 9,015 (77.80) | 1,286 (22.19) | 4,507 (77.80) |
| Telangana | 1,049 (20.99) | 3,947 (79.00) | 525 (21.01) | 1,973 (78.98) |
| Daman and Diu | 12 (19.04) | 51 (80.95) | 6 (19.35) | 25 (80.64) |
| Ladakh | - | - | - | - |

care physicians and nurses. Medical staff who do not specialize in ICU care should also receive training in this area. The Ministry of Health has also implemented online training on critical care management for ICU and non-ICU doctors through the All India Institute of Medical Sciences, New Delhi.¹⁵

These resources will probably be even more scarce in smaller towns, cities, and districts. In Madhya Pradesh, a sizable state in

central India, for instance, 30 of the 49 districts lacked an ICU, and of the remaining 19, more than two-thirds were concentrated in just four urban districts.¹⁶ These statistics show how severely unequal access to acute care is in India. Around 15,000 ventilators are thought to be readily available in India, where an estimated 50% of ICUs have the ability for mechanical ventilation. Other estimates place the total number of ventilators at around

Table 2: State-wise proportion of ICU beds in the public and private sectors to the state-wise population of India

| Name of the state or union territory | Estimated public sector ICU beds in association with the population n (%) ³ | Estimated private sector ICU beds in association with the population n (%) ³ | Total population census 2011 ⁴ |
|--|--|---|---|
| Better availability of ICU beds in the public sector | | | |
| Punjab | 897 (0.032) | 2,153 (0.007) | 2,77,43,338 |
| Lakshadweep | 15 (0.023) | 6 (0.009) | 64,473 |
| Chandigarh | 188 (0.017) | 94 (0.008) | 10,55,450 |
| Andaman and Nicobar Islands | 54 (0.014) | 11 (0.002) | 3,80,581 |
| Puducherry | 178 (0.014) | 80 (0.006) | 12,47,953 |
| Sikkim | 78 (0.012) | 20 (0.003) | 6,10,577 |
| Goa | 151 (0.010) | 79 (0.005) | 14,58,545 |
| The average availability of ICU beds in the public sector | | | |
| Himachal Pradesh | 620 (0.009) | 182 (0.002) | 68,64,602 |
| Mizoram | 100 (0.009) | 25 (0.002) | 10,97,206 |
| Dadra and Nagar Haveli | 31 (0.009) | 16 (0.004) | 3,43,709 |
| Arunachal Pradesh | 120 (0.008) | 11 (0.0007) | 13,83,727 |
| Meghalaya | 223 (0.007) | 39 (0.001) | 29,66,889 |
| Delhi | 1,219 (0.007) | 754 (0.004) | 1,67,87,941 |
| Tripura | 221 (0.006) | 12 (0.0003) | 36,73,917 |
| Tamil Nadu | 3,877 (0.005) | 3,892 (0.005) | 7,21,47,030 |
| Karnataka | 3,486 (0.005) | 9,619 (0.015) | 6,10,95,297 |
| Kerala | 1,900 (0.005) | 3,061 (0.009) | 3,34,06,061 |
| Bihar | 583 (0.0005) | 960 (0.0009) | 10,40,99,452 |
| Below average availability of ICU beds in the public sector | | | |
| Uttarakhand | 426 (0.004) | 767 (0.007) | 1,00,86,292 |
| West Bengal | 3,928 (0.004) | 1,748 (0.001) | 9,12,76,115 |
| Daman and Diu | 12 (0.004) | 51 (0.02) | 2,43,247 |
| Nagaland | 94 (0.004) | 34 (0.001) | 19,78,502 |
| Rajasthan | 2,353 (0.003) | 2,306 (0.003) | 6,85,48,437 |
| Maharashtra | 2,572 (0.002) | 9,015 (0.008) | 11,23,74,333 |
| Madhya Pradesh | 1,555 (0.002) | 1,692 (0.002) | 7,26,26,809 |
| Odisha | 926 (0.002) | 357 (0.0008) | 4,19,74,218 |
| Assam | 857 (0.002) | 352 (0.001) | 3,12,05,576 |
| Haryana | 562 (0.002) | 1,245 (0.004) | 2,53,51,462 |
| Jammu and Kashmir | 365 (0.002) | 35 (0.0002) | 1,25,41,302 |
| Manipur | 71 (0.002) | 18 (0.0006) | 28,55,794 |
| Uttar Pradesh | 3,813 (0.001) | 10,257 (0.005) | 19,98,12,341 |
| Andhra Pradesh | 1,157 (0.001) | 3,005 (0.003) | 8,45,80,777 |
| Gujarat | 1,009 (0.001) | 2,234 (0.003) | 6,04,39,692 |
| Jharkhand | 539 (0.001) | 786 (0.002) | 3,29,88,134 |
| Chhattisgarh | 471 (0.001) | 401 (0.001) | 2,55,45,198 |
| Telangana | 1,049 | 3,947 | - |
| Ladakh | - | - | - |

48,000, which is still significantly fewer than what would be required in the case of a surge;¹⁷ to meet the anticipated increase in demand, the Government has roped in several Indian companies

to manufacture and deliver ventilators rapidly.¹⁸ The government has contracted with several Indian businesses to quickly produce and deliver ventilators in order to meet the anticipated increase in

Table 3: State-wise proportion of ventilators in public and private sector to a state-wise population of India

| <i>Name of the state or union territory</i> | <i>Estimated public sector ventilators in association with population n (%)³</i> | <i>Estimated private sector ventilators in association with population n (%)³</i> | <i>Total population census 2011⁴</i> |
|---|---|--|---|
| Better availability of ventilators in the public sector | | | |
| Lakshadweep | 8 (0.012) | 3 (0.004) | 64,473 |
| Chandigarh | 94 (0.008) | 47 (0.004) | 10,55,450 |
| Puducherry | 89 (0.007) | 40 (0.003) | 12,47,953 |
| Andaman and Nicobar Islands | 27 (0.007) | 5 (0.001) | 3,80,581 |
| Sikkim | 39 (0.006) | 10 (0.001) | 6,10,577 |
| Goa | 75 (0.005) | 39 (0.002) | 14,58,545 |
| The average availability of ventilators in the public sector | | | |
| Arunachal Pradesh | 60 (0.004) | 6 (0.0004) | 13,83,727 |
| Mizoram | 50 (0.004) | 12 (0.001) | 10,97,206 |
| Himachal Pradesh | 310 (0.004) | 91 (0.001) | 68,64,602 |
| Dadra and Nagar Haveli | 15 (0.004) | 8 (0.002) | 3,43,709 |
| Delhi | 610 (0.003) | 377 (0.002) | 1,67,87,941 |
| Tripura | 111 (0.003) | 6 (0.0001) | 36,73,917 |
| Meghalaya | 111 (0.003) | 20 (0.0006) | 29,66,889 |
| West Bengal | 1,964 (0.002) | 874 (0.0009) | 9,12,76,115 |
| Tamil Nadu | 1,938 (0.002) | 1,946 (0.002) | 7,21,47,030 |
| Karnataka | 1,743 (0.002) | 4,810 (0.007) | 6,10,95,297 |
| Uttarakhand | 213 (0.002) | 383 (0.003) | 1,00,86,292 |
| Kerala | 950 (0.002) | 1,531 (0.004) | 3,34,06,061 |
| Nagaland | 47 (0.002) | 17 (0.0008) | 19,78,502 |
| Daman and Diu | 6 (0.002) | 25 (0.01) | 2,43,247 |
| Maharashtra | 1,286 (0.001) | 4,507 (0.004) | 11,23,74,333 |
| Rajasthan | 1,176 (0.001) | 1,153 (0.001) | 6,85,48,437 |
| Madhya Pradesh | 778 (0.001) | 846 (0.001) | 7,26,26,809 |
| Odisha | 463 (0.001) | 178 (0.0004) | 4,19,74,218 |
| Punjab | 448 (0.001) | 1,077 (0.003) | 2,77,43,338 |
| Assam | 429 (0.001) | 176 (0.0005) | 3,12,05,576 |
| Haryana | 281 (0.001) | 623 (0.002) | 2,53,51,462 |
| Jammu and Kashmir | 182 (0.001) | 18 (0.0001) | 1,25,41,302 |
| Manipur | 36 (0.001) | 9 (0.0003) | 28,55,794 |
| Below average availability of ventilators in the public sector | | | |
| Uttar Pradesh | 1,907 (0.0009) | 5,129 (0.002) | 19,98,12,341 |
| Chhattisgarh | 235 (0.0009) | 200 (0.0007) | 2,55,45,198 |
| Gujarat | 504 (0.0008) | 1,117 (0.001) | 6,04,39,692 |
| Jharkhand | 270 (0.0008) | 393 (0.001) | 3,29,88,134 |
| Andhra Pradesh | 578 (0.0006) | 1,502 (0.001) | 8,45,80,777 |
| Bihar | 292 (0.0002) | 480 (0.0004) | 10,40,99,452 |
| Ladakh | – | – | |
| Telangana | 525 | 1,973 | |

demand.¹⁸ There are also no published data on the precise number of specific pieces of equipment, such as infusion pumps, which are necessary for the delivery of vital medications like sedatives,

analgesics, inotropes, and vasopressors, even though consensus statements from the ISCCM have stipulated the minimum number of bedside equipment per bed.¹⁹

Table 4: State-wise availability of seats for nurse practitioners in critical care (NPCC) program

| S. no | State | Total number of seats ⁵ |
|-------|-----------------------------|------------------------------------|
| 1. | Karnataka | 130 |
| 2. | Tamil Nadu | 55 |
| 3. | Kerala | 40 |
| 4. | Uttar Pradesh | 40 |
| 5. | Uttarakhand | 25 |
| 6. | Gujarat | 20 |
| 7. | Haryana | 20 |
| 8. | Maharashtra | 20 |
| 9. | Telangana | 20 |
| 10. | Punjab | 15 |
| 11. | Union territory: Puducherry | 10 |
| 12. | Andhra Pradesh | 10 |
| 13. | Assam | 10 |
| 14. | Madhya Pradesh | 10 |
| 15. | West Bengal | 10 |
| Total | | 435 |

Table 5: State-wise availability of seats for Doctorate of Medicine (DM) in critical care medicine

| S. no | State | Total number of seats ^{6,7} |
|-------|-----------------------------|--------------------------------------|
| 1. | Uttarakhand | 10 |
| 2. | Maharashtra | 9 |
| 3. | Tamil Nadu | 7 |
| 4. | Rajasthan | 6 |
| 5. | Uttar Pradesh | 5 |
| 6. | Karnataka | 4 |
| 7. | Madhya Pradesh | 3 |
| 8. | Punjab | 2 |
| 9. | Andhra Pradesh | 2 |
| 10. | Odisha | 2 |
| 11. | West Bengal | 2 |
| 12. | Union territory: Puducherry | 2 |
| Total | | 54 |

Public sector in India, Tripura has the highest number of ICU beds, i.e., 221 (94.84), least is the Daman and Diu 12 (19.04%). The frequency of 0.001% represents the low availability of ICU beds in Chhattisgarh and frequency of 0.032% (Punjab) means the highest availability of ICU beds in the public sector. The total number of ventilators in public (high to low availability) and private sectors is proportionate to the state population. The frequency of 0.0002% (Bihar) represents the low availability, and the frequency of 0.012% (Lakshadweep) represents the highest availability of ventilators in the public sector. There are 3.6 critical care beds per 100,000 people, according to a recent cross-sectional study of 23 Asian countries and regions (covering 92% of the continent's population). Canada

Table 6: Indian diploma in critical care medicine accredited institutions and their annual intake of seats

| State | Annual intake ^{6,7} |
|----------------|------------------------------|
| Maharashtra | 135 |
| Assam | 130 |
| Uttar Pradesh | 61 |
| Andhra Pradesh | 50 |
| Gujarat | 46 |
| Tamil Nadu | 34 |
| Telangana | 26 |
| Odisha | 24 |
| New Delhi | 18 |
| Karnataka | 16 |
| Kerala | 16 |
| Haryana | 16 |
| Chhattisgarh | 14 |
| West Bengal | 12 |
| Rajasthan | 12 |
| Punjab | 12 |
| Total | 622 |

and Germany, in contrast, have 12.9 and 29.2 beds per 100,000 people, respectively. The estimated number of ICU beds in India is 29,997 (3.7% of acute hospital beds), or 2.3 beds for every 100,000 people.²⁰ There are no publicly accessible databases that list the total number of ICU beds, so the majority of the data used in this study comes from a private pharmaceutical company's database in India. As a result, these figures are probably low, and other models (which assume 5–8% of hospital beds are critical care beds) estimate the total number of ICU beds to be close to 95,000.¹⁷

Another major factor is the expensive infrastructure for providing intensive care. The situation of ICU development in India is quickly catching up. There has been an astounding growth in this area as a result of ISCCM initiatives, promotions, education, and training programs over the past 15 years. However, there is still much work to be done in the areas of infrastructure, human resource development, protocol, the creation of guidelines, and research, all of which should be pertinent to Indian conditions. In the present study, with the data given by the ISCCM for the 12-bedded ICU equipment, the calculation is done for the average cost of the equipment, the average cost of the equipment as per the requirement given by the ISCCM and the total cost of the equipment for the 12-bedded ICU. The total cost for 12-bedded ICU is seven crores sixty-four lakhs twenty-four thousand and nine hundred and sixty-six rupees. High-cost instruments for ICU is around seven crores sixty lakhs six hundred and fourteen rupees (7,60,00,614). According to research provided by the "Stockholm International Peace Research Institute (SIPRI)", India's military budget grew to US \$76.6 billion in 2021, representing a 0.9% rise over 2020 statistics (SIPRI).²¹ India has allocated Rs. 234,846 crores for health care for FY22 by the Finance Minister.²²

In all hospitals and facility types in India, there are reportedly about 70,000 ICU beds available. Five million patients per year in India are served by small nursing homes who need ICU admission. India currently spends Rs 103,000 crores on health care, and by 2012,

Table 7: List of equipment for 12-bedded ICU

| S. no | Name of equipment ⁸ | Number | The average cost of the equipment in Rs | Average cost as per the requirement of the equipment in Rs | Cost for 12-bedded ICU in Rs |
|--|--|--|---|--|------------------------------|
| List of equipment (costs above 1 lakh) | | | | | |
| 1. | Ventilators | 6 | 6,33,815 | 38,02,890 | 4,56,34,680 |
| 2. | Infusion pumps | 2 per bed | 3,58,485 | 7,16,970 | 1,72,07,280 |
| 3. | Defibrillator | 2 with TCP | 2,11,250 | 4,22,500 | 50,70,000 |
| 4. | Noninvasive ventilators | 3 | 90,000 | 2,70,000 | 32,40,000 |
| 5. | Syringe pumps | 2 per bed in ICU | 57,110 | 1,14,220 | 27,41,280 |
| 6. | Continuous renal replacement therapy (CRRT) | 1 | 14 lakhs | 14 lakhs | 14 lakhs |
| 7. | ICU dedicated ultrasound and echo machine | 1 | 11.5 lakhs | 11.5 lakhs | 11.5 lakhs |
| 8. | ICU beds (shock proof) (fiber) | 1 for each bed | 79,107 | 79,107 | 9,49,284 |
| 9. | ABG machine | 1 + 1 | 4,51,303 | 9,02,606 | 9,02,606 |
| 10. | Crash/resuscitation trolley | 2 for ICU | 32,766 | 65,532 | 7,86,384 |
| 11. | Bedside monitors | 1 per bed | 62,175 | 62,175 | 7,46,100 |
| 12. | IA balloon pump | 1 | 5 lakhs | 5 lakhs | 5 lakhs |
| 13. | Intubating videoscope | 1 | 3.50 lakhs | 3.50 lakhs | 3.50 lakhs |
| 14. | ETO sterilization (ETO – ethylene oxide gas) | 1 | 2.25 lakhs | 2.25 lakhs | 2.25 lakhs |
| 15. | HD machines | 2 | 84,000 | 1,68,000 | 1,68,000 |
| Total | | | | | 7,60,00,614 |
| List of equipment (ranging between Rs 10,000 and 1 lakh) | | | | | |
| 16. | Bedside X-ray | 1 | 93,000 | 93,000 | 93,000 |
| 17. | Headend panel | 1 per bed | 6,300 | 6,300 | 75,600 |
| 18. | Overbed tables | 1for each bed | 5,522 | 5,522 | 66,264 |
| 19. | Intermittent leg compressing machine | 2 | 28,800 | 57,600 | 57,600 |
| 20. | Computers | 2 (for ICU), 1 for incharge | 15,999 | 47,997 | 47,997 |
| 21. | Fiberoptic bronchoscope | 1 | 20,000 | 20,000 | 20,000 |
| 22. | Spinal board | 2 | 9,402 | 18,804 | 18,804 |
| 23. | Ambu mask different sizes | 10 sets, including two for pediatric use | 1,075/piece | 10,750 | 10,750 |
| Total | | | | | 3,90,015 |
| List of equipment (below Rs 10,000) | | | | | |
| 24. | CO (carbon monoxide), SVR (systemic vascular resistance), ScvO ₂ (central venous oxygen saturation) monitor | 1 | 8,999 | 8,999 | 8,999 |
| 25. | Airbeds | 6 | 1,350 | 8,100 | 8,100 |
| 26. | Trays for procedures | For putting central lines, ICD, catheters, etc. ⁸ | 735 | 5,880 | 5,880 |
| 27. | Rigid cervical spine collars | 4 | 1,300 | 5,200 | 5,200 |
| 28. | Glucometer | 2 for ICU | 1,730 | 3,460 | 3,460 |
| 29. | Pulse oximeter (small units) | 2 | 1,349 | 2,698 | 2,698 |
| Total | | | | | 34,337 |
| Total | | | | 7,64,24,966 | |

it is anticipated that this amount will increase to Rs 283,000 crores. However, over the next 10 years, the government and international organizations will only be able to invest Rs 30,000 crores in health care infrastructure. Critical care makes up 20–30% of a hospital's budget, so nearly 80% of investment will need to come from the for-profit private and nonprofit sectors. More than 80% of patients must pay for medical services out-of-pocket (OOP) if they do not have comprehensive insurance coverage. It is generally acknowledged that one episode of hospitalization accounts for 58% of per capita expenditure, pushing 2.2% of the population below the poverty line despite economic growth and the development of a middle-class population with purchasing power. The fact that more than 40% of patients admitted to an ICU were compelled to sell assets or borrow money is even more concerning. Knowing these problems causes the clinician to be in a difficult ethical situation, especially when the patient's clinical condition points to a poor outcome. Unfortunately, the average person has unrealistic expectations for the outcomes of critical care and thinks that miracles frequently occur in ICUs.²³

The Indian government expenditure on defense is more when compared to healthcare. Hence, the central and state governments should act on a nonprofit basis to enhance the funding for the critical care unit in the public sector. A true effort and dedication beyond monetary contributions are required by the central and state governments instead of private organizations to have a long-term influence. Multinational pharmaceutical companies have a limited presence in India; their medicine portfolio is restricted, their marketing organization is inadequate, and their domestic activities are minimal.¹⁹ According to the results of the NITI Aayog's "Investment Opportunities in India's Healthcare Sector" study for 2021, India imports a substantial portion of its medical equipment to suit its existing needs. In 2019–2020, India's medical device imports were \$1766 million, while exports were \$986 million.²⁴ India's patent legislation must now include a provision for the availability of patents for pharmaceutical products and processes inventions.²⁵ According to recent studies, the average availability of pharmaceuticals in the public sector in LMICs (low, and middle-income countries) is barely 35%. The World Health Organization (WHO) estimates that 68% of Indians have limited or no access to necessary medicines. Due to the public sector's shortage of medicines, household OOP spending on medications has risen, making them the second-largest household expenditure after food. Out of pocket payments are used by up to 90% of the people in impoverished nations to purchase medications. Patients OOP bear about 80% of India's health care expenses, with drugs accounting for 70%. Another study conducted in the three North Indian states of Haryana, Punjab, and Chandigarh found that households in the public sector paid between 59 and 86% of the cost of outpatient departments (OPD) and 19–47% of hospitalization costs directly for drugs.²⁶ Hence, the central government should enact a provision for the manufacturing of medicines and equipment by all the state governments by establishing its research and manufacturing units and industries with the aim of providing safe and budget-friendly critical care services to all the citizens across India. These out-of-box solutions should be immediately implemented to save millions of Indians from misery and poverty.

CONCLUSION

India's critical care and public health capacity is under tremendous strain due to its population of over 1.3 billion people, the majority of whom live in rural and remote areas. Critical care in the public

sector requires an overall boost from unconventional solutions. According to the SIPRI, India spent the third most on defense in the world in 2021. India spent 76.6 billion dollars on its military in 2021, up 33% from 2012 and 0.9% from 2020. However, since India is considered a fast-growing economy, there is still a huge disparity in critical care. Without resetting critical health care, India cannot grow in welfare indices even if it is among the top GDP countries. Hence, revamping the Indian critical health care delivery system is essential for the welfare of all citizens, not only in pandemics but also during any emergency circumstances.

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