

# Infectious Disease and Antimicrobial Agents the Best Way to Use a Limited Resource

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## Introduction

### We can see today some critically conditions in field of infectious disease therapy

Few new class molecules introduced in therapy, MDR and other serious resistances rapidly expanding

Abuse or misuse of some parenteral antimicrobial out of hospital settings, new infectious disease epidemic situations and limited economic resource level to be assigned to infectious disease pathology for the public institutions. The same we observe in example the high efficacy of some antiviral therapy as in hepatitis-C and the role in reducing also the liver transplant needs. (pharmacology v/s surgery strategies). High cost but high efficacy.

The high rate in relapses in some condition [1] or inefficacy due by rapid resistance diffusion need new strategies in drug design and drug re-design in order to improve ADME PROFILE, drug delivery systems or modify (in dynamics or other mechanism) able to improve the real efficacy to the drugs we have today available. Perhaps the creativity approach without too much bureaucracy can give the right results in this time in order to discover or improve newer classic pharmacological strategy [2]. We have seen in last 2 centuries many discovering in anti-microbial drug class (1850 -1970) and due I many time to unexpected effect or by errors (penicillium notatum at other examples).

The severe infectious diseases are imply often in high mortality rate in ICU and in other critical wards and the clinical pharmacists role can improve this specific rate by adding a more rational decision making system in antimicrobials use [3,4]. Many antimicrobials are also associated with resistance pattern and all this condition need an efficacy strategy to best use this clinical resource we have today. A misuse or abuse in this approach results in dangerous situation related to severe infectious disease we can see today (killer bacteria- superbugs). The critical clinical patient conditions require often the less nephrotoxic drugs (but with high efficacy): Saving life

drugs must be used with the best decision making systems and this can results in improving patient survival. (The multi-disciplinarity gives more results v/s monodiscipl medical team). To do this in the right way is needed multidisciplinary equips [3] with added medicinal chemistry competences. To correctly set the problem under the light of the different discipline (clinicians, pharmaceuticals, biologists, statistics at other involved).

The association of clinical pharmacy and medicinal chemistry competence also at single researcher level can contribute to overtake the failure in some antimicrobial strategy.

### We can observe some literature involved in infectious disease clinical pharmacy:

**According article- Infectious Disease Pharmaceutical Care:**  
The Role of the Clinical hospital Pharmacists to Improve Clinical Outcomes 2017 "Today more than past we need to improve clinical outcomes in the management of infectious disease pathology and drug therapy related to critical patient (septic shock, sepsis, MOF, invasive fungal infections, HIV, peritonitis, meningitis, endocarditis, osteomyelitis, pneumonia, severe UTI, leukaemia and many other condition). The same way we can see the high efficacy of some new pharmacological molecules in eradicate severe infectious (in example hepatitis C), saving the HIGH cost for transplant involved. This condition needs today a more active role and permanent presence of clinical hospital pharmacist in medical team because these kinds of pharmacological therapies highly involved in patient's health [2]".

And as reported in article The Clinical Pharmacist Competence as Pharmaceutical Drug Design Tool "The hospital clinical pharmacist specific competences added to medicinal chemistry-pharmaceutical knowledge and expertise are efficacy instruments to translate to the big pharmaceutical industries the modification of pharmacological-drugs molecule or the need to search new strategy in drug therapy if not efficacy as request [5]".



Also in surgery field the role played by clinical pharmacist is relevant [6] in field of example the antimicrobial surgery prophylaxis.

According Basak et al. [7] "We hereby conclude that the early detection and close monitoring of MDR, XDR, or even PDR bacterial strains must be started by all clinical microbiology laboratories to reduce the menace of antimicrobial resistance which is now a global problem".

According Bond et al. [8] a multi-variety mathematics regression analysis, controlling for severity of illness, was employed to determine the associations. 4 clinical pharmacy services were associated with a lower mortality rates: clinical research ( $p < 0.0001$ ), his is the first study to indicate that both centrally based and patient-specific clinical pharmacy services are associated with a reduced hospital mortality rates. This suggests that these clinical ph. services save a significant n. of lives in our hospitals".

Gentry CA et al. [9] wrote that: "The clinical outcomes and the cost-effectiveness analysis of an antimicrobial control program (ACP) were verified. The ACP program was associated with a 2.4-day decrease in length of stay and a reduction in mortality from 8.28 % ( control) to 6.61 % ( intervention) ( $p = 0.01$ ). Inpatient pharmacy costs other than IV anti-microbial decreased an average of only 5.7% over the two program years, but the acquisition cost of IV anti-microbial drugs for both program years yielded a total cost reduction of 30.8%. An ACP program directed by clinical pharmacist trained in infectious diseases was associated with improvements in inpatient length of stay and mortality. The ACP program decreased intravenous antimicrobial costs and facilitated the approval process for restricted and non- formulary anti-microbial".

Bond et al. [10] showed that "tended to have the greatest association with reductions in mortality rate. As the clinical pharmacist staffing levels increased from the tenth percentile level (0.34/100 occupied beds) to the ninetieth percentile (3.23/100 occupied beds) level, hospital deaths declined from 113/1000 to 64/1000 admissions (with 43% decline). (reduction of 395 deaths/hospital/year when clinical pharmacist staffing went from the tenth to the ninetieth percentile). Reduction of 1.09 deaths/day/hospitals having clinical pharmacy service staffing between these staffing levels, or 320 dollars of pharmacist salary cost/death averted. This variable was associated with reduced length of stay in 1024 hospitals: the drug protocol management (slope-1.30,  $p = 0.008$ ), pharmacist participation on medical rounds (slope-1.71,  $p < 0.001$ ), and number of clinical pharmacists/occupied bed (slope-26.59,  $p < 0.001$ ). It was fined that as drug costs/occupied bed/year increased, severity of illness-adjusted mortality rates decreased (slope-38609852,  $R(2) 8.2%$ ,  $p < 0.0001$ ) and that As the total cost of care/occupied bed/year increased, those same mortality rates decreased (slope-5846720642,  $R(2) 14.9%$ ,  $p < 0.0001$ ). Seventeen clinical pharmacy services were associated with improvements in the four variables".

Luisetto et al. [11] in 2017 reported "Today we need to rethink the actual model to discover new pharmacological

molecules and drugs and reintroducing the same methods used in the period 1860-1970 to have new really efficacy drug classes and pharmacological strategies. The clinical pharmacists and pharmaceutical competences added to the specific medicinal chemistry knowledge applied also in small research laboratory can give more clinical results to be translated to the industrial pharmacy settings. Creativity added to the medicinal chemistry competences and the knowhow of the clinical pharmacist and the other clinicians can give right strategy to introduce drugs whit really efficacy (not only me too drugs).

The new algorithm must be in the first step of discovering process not to go on in registration procedure of not really efficacy pharmacological molecules (or drugs) only due by economic purpose but only related to the patients clinical outcomes goal. The same (after registration process) the drugs re-design of the molecule to improve the clinical efficacy must require a low level in bureaucracy as possible (Respecting the ethical principle and the patient safety). Creativity added to the single level of health care researcher activity must not to be compressed by a too much bureaucratic systems level or to a business affair systems too much oriented to the business-economic results".

In a lancet infection disease meta-analysis was reported that our findings of beneficial effects on outcomes with nine anti-microbial stewardship objectives suggest they can guide the stewardship equips in their efforts to improve the quality of anti-biotic use in hospitals settings [12].

## Discussion & Conclusion

The infectious disease and anti-microbial agent use imply deep knowledge and expertise in this field by medical team and clinical pharmaceutical care principle can complete the clinicians works in more rational way (in example Preserving the activity of some critical drugs from MDR diffusion [7] or to provide new molecular modifying strategies to introduce more efficacy drugs.

We think that using the methods of the researcher in 1800-1900 in their laboratory without a lot of bureaucratic rules we can obtain more relevant pharmacological molecules to introduce in therapy today. We can think also that a more rapid process in improving some chemical characteristics of some drugs (also using modify in drug delivery systems or other procedure) is today requested and this can be reached also by single research level. This work must be favored by registrative institution in an acceptable toxicity risk level in order to have more chances in drug discovering and re-designing. Every scientific discipline present good achievement but often failure and what is relevant is the way chosen to have a more rational response in the management of some vital antimicrobial agents in example deeply introducing the medicinal chemistry and clinical pharmacy discipline in clinical setting.

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