

## New Insights in Hypertension

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### SUMMARY

Hypertension is one of the most common chronic illnesses encountered in the perioperative period. Therefore, the preoperative assessment of hypertensive patient is both a common and an important problem for the anesthesiologists, because of the deleterious and predictable effects of hypertension on cardiovascular, renal and cerebrovascular function, individuals with untreated hypertension have significant perioperative morbidity. This article presents an overview on the current literature regarding the hypertensive patients and a simple graphic strategy for the perioperative management of hypertension and its impact on perioperative outcome.

**Key words:** Hypertension, Perioperative management, Cardiac protection.

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### INTRODUCTION

How often have we asked ourselves: shall I go ahead and anaesthetize this patient with uncontrolled hypertension, or should I postpone surgery until the arterial pressure is controlled? Does the benefit of preoperative arterial pressure control justify the inconvenience and financial consequences of postponing surgery? Are patients with uncontrolled hypertension at an increased perioperative risk? Are there any data on which I can base my decision?

Hypertension affects one billion individuals worldwide<sup>1</sup> and is endemic in the western world, particularly in the elderly<sup>2</sup>. Hypertension represents a major risk factor for coronary artery disease<sup>3</sup>, congestive heart failure<sup>4</sup>, dementia<sup>5</sup> and renal and cerebrovascular disease<sup>6</sup> and is associated with dyslipidaemia, diabetes and obesity.<sup>6</sup> The higher the arterial pressure, the higher the risk of myocardial infarction, heart failure, stroke, or kidney disease. Between the age of 40 and 70 yr, for each increment

of 20 mm Hg in systolic or 10 mm Hg in diastolic arterial pressure, the chance of developing cardiovascular disease doubles across the arterial pressure range from 115/75 to 185/115 mm Hg.<sup>7</sup> Therefore, the need for tight arterial pressure control and life-long treatment is undisputed.

### What is hypertension?

The "Seventh Report of the Joint National Committee on 'Prevention, Detection, Evaluation, and Treatment of High Blood Pressure'" provides a classification of BP for adults ages 18 and older<sup>1</sup> (Table 1). The classification is based on the average of two or more properly measured, seated BP readings on each of two or more office visits. In contrast to the classification provided in the JNC 6 report<sup>8</sup> a new category designated prehypertension has been added, and stages 2 and 3 hypertension have been combined. Patients with pre-hypertension, are at increased risk for progression to hypertension; those in the 130-139/80-89 mm Hg BP range are at twice the risk to



**Table 1: Classification of blood pressure for adults (JNC-7)<sup>1</sup>**

BP classification	SBP (mm Hg)	DBP (mm Hg)
Normal	< 120	and < 80
Prehypertension	120-139	or 80-89
Stage 1 hypertension	140-159	or 90-99
Stage 2 hypertension	160	or 100

develop hypertension as those with lower values<sup>9</sup>.

### Pathophysiology of hypertension:

Hypertension can be either idiopathic (essential) or less commonly secondary.

Essential hypertension accounts for 80-95% of cases and may be associated with an abnormal baseline elevation of cardiac output, systemic vascular resistance (SVR) or both. An evolving pattern is commonly seen over the course of the disease. Initially, cardiac output is elevated, but SVR appears to be in the normal range (in reality, it is inappropriately high). As the disease progresses, cardiac output returns to normal but SVR becomes abnormally high. Extracellular fluid volume and plasma renin activity may be low, normal or high.<sup>10</sup>

Major advances in genomics and proteomics have led to the discovery of the genetic background that many individuals have, that predisposes them to develop hypertension. The role of ACE-I in the treatment of hypertension has been known since long, so it shouldn't be surprising that some individuals with hypertension have a polymorphism of the ACE gene<sup>11</sup> that leads them to develop hypertension. Mutations in the WNK family of serine-threonine kinases have recently been identified as causing pseudohypoaldosteronism type-II manifested by the development of hypertension, renal salt reabsorption, and impaired potassium and hydrogen ion excretion<sup>12</sup>.

In only 5-10% of patients, blood pressure elevation is due to a specific, treatable underlying cause called secondary hypertension (Table 2)<sup>13</sup>.

The mechanisms responsible for the changes observed in hypertensive patients remain elusive but appear to involve vascular hypertrophy, hyperinsulinemia, abnormal increases in intracellular calcium and increased intracellular sodium concentrations in vascular smooth muscle and renal tubular cells. The increased intracellular calcium presumably results in increased arteriolar tone, while the increased sodium concentration impairs renal excretion of sodium. Sympathetic nervous system overactivity and enhanced responses to sympathetic agonists are present in some patients. Hypertensive

**Table 2: Causes of secondary hypertension in the preoperative patient.**

Medical causes	Drug induced
Common	Caffeine
Renal	Cocaine
Renal parenchymal disease	Chlorpromazine
Renovascular hypertension	Cyclosporine
Endocrine	Ethanol
Phaeochromocytoma	MAO inhibitors
Cushing's disease	Nicotine
Hyperaldosteronism	NSAIDs
Thyroid disease	Oral contraceptives
Pre-eclampsia	Steroids
Aortic coarctation	Sympathomimetics
Sleep apnoea	Nasal decongestants
Rare	Weight loss agents
Renin-producing tumors	
Adrenogenital syndrome	
Acromegaly	
Hypercalcemia	
Familial dysautonomia	
Porphyria and other systemic neuropathies	

patients often display an exaggerated response to vasopressors. Overactivity of the renin-angiotensin-aldosterone system appears to play an important role in patients with accelerated hypertension<sup>10</sup>.

### Why should anesthesiologists remain wary of hypertension?

For at least three reasons:

- (i) Hypertensive patients tend to be more



haemodynamically unstable and prone to myocardial ischaemia in the perioperative period<sup>14,15</sup> Several studies have demonstrated a significant association between perioperative myocardial ischaemia and postoperative ischaemic cardiac events, such as unstable angina, non-fatal myocardial infarction, and cardiac death<sup>16,17</sup>.

(ii) Hypertension is a major risk factor for coronary artery disease<sup>3,18</sup>, congestive heart failure<sup>4</sup>, and renal and cerebrovascular disease.<sup>6</sup> Any of these factors increase the likelihood of perioperative myocardial infarction or death<sup>19</sup>.

(iii) Hypertension is associated with dyslipidaemia, diabetes and obesity<sup>6</sup> and the sideeffects of drugs needed to treat these diseases.<sup>20,21</sup>

### How can we safely anaesthetize hypertensive patients?

Essential elements of perioperative management include careful preoperative evaluation, tight perioperative arterial pressure and heart rate control, cardiac protection, and well trained experienced and dedicated anesthesiologists.

Assessment and management of the hypertensive patient in the preoperative period

Arterial hypertension is a systemic disease, with serious potential consequences for the entire cardiovascular system, particularly during the preoperative, intraoperative and postoperative periods. Therefore, a complete preoperative evaluation of the hypertensive patient is essential.

Essential questions in the preoperative assessment of hypertension

1. Severity? Prehypertension, stage I & II
2. Duration? Recent onset, Chronic
3. Secondary hypertension?
4. End-organ damage?
5. Need for preoperative therapy?

### Secondary hypertension

Secondary causes of hypertension should be sought in the following patients:<sup>22</sup>

1. Blood pressure is greater than 180 mm Hg systolic or 110 mm Hg diastolic.
2. Blood pressure is not controlled by drug therapy with two or more agents.
3. Well-controlled blood pressure begins to increase.
4. Sudden-onset, labile or paroxysmal hypertension is present.
5. Hypertension began before age 25 or after age 50.

Guidelines for screening for common causes of secondary hypertension<sup>13</sup> are given in Table 3

### End-organ damage and systemic cardiovascular disease

End-organ disease of the heart, brain and kidney associated with hypertension has as much potential to cause morbidity in the perioperative period as does the elevated blood pressure itself. Guidelines for the preoperative assessment of end-organ damage<sup>13</sup> are given in Table 3:

### Preoperative antihypertensive therapy

To establish a rational plan for preoperative

History	Physical examination	Laboratory tests
Duration and clinical course of hypertension	Blood pressure level	Creatinine
Episodic tachycardia	Body habitus	Glucose
Palpitations	Thyromegaly	Potassium
Headache	Abdominal masses or bruits	Electrocardiogram
Perspiration	Peripheral pulses	Chest film
Drug use		

therapy, the clinician needs to know (i) which hypertensive patients are at increased perioperative risk (ii) Will lowering the blood pressure preoperatively lower risk? (iii) How and how long should hypertensive patients be treated before elective surgery?



**Preoperative hypertension**

**Systolic (ISH), diastolic (IDH) and pulse pressure hypertension (PPH):**

For many decades, diastolic hypertension has been considered the standard for detection, evaluation, and treatment of high blood pressure with systolic hypertension being regarded as a normal process of aging and carrying less risk of vascular outcomes. Diastolic hypertension is believed to be related to microvascular pathology by a number of proposed mechanisms, including capillary density, increased sensitivity to neurohumoral stimulation, and increased endothelial to luminal compensatory changes<sup>23</sup>. According to data from the Framingham

cellular inflammatory response,<sup>29</sup> and platelet activation, which can compromise microvascular blood flow.<sup>30</sup> An association between preexisting hypertension and increased risk of perioperative stroke, myocardial infarction, congestive heart failure, bleeding, and renal dysfunction has been demonstrated. Nevertheless, no absolute threshold of systolic or diastolic blood pressure has been tested.<sup>31</sup> Only recently has classification of blood pressure been put forth to include subtypes of systolic and diastolic hypertension: ISH (systolic > 140 mm Hg and diastolic < 90 mm Hg), IDH (systolic < 140 mm Hg and diastolic > 90 mm Hg), and combined systolic and diastolic hypertension (CSDH; systolic > 140 mm Hg and diastolic > 90 mm Hg).

Table 3: Assessment of the severity of end-organ damage in the preoperative hypertensive patient.

End Organ Damage	History	Physical examination	Laboratory tests
Cardiac disease	Angina, exercise tolerance	Ventricular lift or heave or rales in advanced LVF	Electrocardiogram, chest film, ? echocardiogram, ? stress test with or without echocardiogram or radionuclide imaging
Cerebrovascular disease	Transient ischaemic attack, stroke	Carotid bruit, retinopathy	Carotid doppler
Renal disease	Weakness, lethargy	Accelerated hypertension, edema	Creatinine, electrolytes

Although previous investigations of hypertension and cardiovascular risk principally focused on the isolated systolic and diastolic blood pressure, evidence now is clear that the pulsatile component of blood pressure or the ventricular-vascular coupling provides important information about cardiovascular risk.<sup>32</sup> Pulse pressure mostly reflects an index of conduit vessel stiffness and the summation of pulse waves; i.e., propagated and reflected waves within the arterial tree.<sup>33</sup>

Group, diastolic hypertension is prevalent in younger individuals (less than 50 years) and remains an important marker of cardiovascular outcomes.<sup>24,25</sup> However, it has been recognized that ISH is the most common subtype of hypertension affecting two-thirds of persons older than 50 years,<sup>26</sup> being associated with greater risks of both fatal and nonfatal stroke and coronary heart disease<sup>27</sup>.

Most individuals with ISH also have PPH and several studies<sup>34</sup> have provided strong evidence that links adverse events to this hypertension. Increase in pulse pressure, however, can occur in the absence of ISH. Importantly, rises in pulse pressure at fixed systolic blood pressure are associated with a greater risk of coronary ischaemic events than increments of systolic pressure at fixed pulse pressures.<sup>35</sup> This may help explain the nonlinear relation between incremental rises in systolic blood pressure and stroke rates.

The assessment, characterization and management of hypertension in the setting of surgery are confounded by acute physiological perturbation involving excessive release of catecholamines, reperfusion injury,<sup>28</sup> humoral and

The Seventh Report of the 'Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure' (JNC 7) provides new guidelines for hypertension, prevention and management. The following are the report's key messages:

- In persons older than 50 years, systolic blood



pressure greater than 140 mmHg is a much more important cardiovascular disease (CVD) risk factor than diastolic blood pressure.

- The risk of CVD beginning at 115/75 mmHg doubles with each increment of 20/10 mmHg; individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension.
- Individuals with a systolic blood pressure of 120-139 mmHg or a diastolic blood pressure of 80-89 mmHg should be considered as prehypertensive and require health-promoting lifestyle modifications to prevent CVD.
- Thiazide-type diuretics should be used in drug treatment for most patients with uncomplicated hypertension, either alone or combined with drugs from other classes. Certain high-risk conditions are compelling indications for the initial use of other antihypertensive drug classes (angiotensin converting enzyme inhibitors, angiotensin receptor blockers, beta-blockers, calcium channel blockers).
- Most patients with hypertension will require two or more antihypertensive medications to achieve goal blood pressure (<140/90 mmHg, or < 130/80 mm Hg for patients with diabetes or chronic kidney disease).
- If blood pressure is > 20/10 mmHg above goal blood pressure, consideration should be given to initiating therapy with two agents, one of which usually should be a thiazide-type diuretic.

## PERIOPERATIVE MANAGEMENT

A recurring question in anaesthetic practice is the degree of preoperative hypertension that is acceptable for patients scheduled for elective surgery. In essence, the result of the meta-analysis of 30 observational studies by Howell and colleague<sup>14</sup> showed that the likelihood of experiencing an adverse perioperative cardiac event is, on average, 1.31- fold (95% confidence interval 1.31-1.51) higher in

hypertensive patients than in normotensive patients. Although this difference in outcome between hypertensive and normotensive individuals is statistically significant, it is of questionable clinical relevance. Therefore, in most clinical situations, cancellation of surgery for the sole reason of uncontrolled hypertension hardly seems a defensible option. This is in accordance with recent guidelines of the American College of Cardiology and the American Heart Association<sup>36</sup> and similar recommendations<sup>18</sup> in which uncontrolled systemic hypertension per se is considered only a minor risk factor that does not affect overall perioperative management.

In special situations, postponement of surgery in hypertensive patients may be justified to allow for additional preoperative cardiac testing. In the context of isolated hypertension, however, additional testing is rarely indicated and should only be considered in patients scheduled for high-risk surgery (e.g., major vascular surgery). If in addition to an elevated arterial pressure, signs of coronary artery (e.g., ischaemic electrocardiographic changes) or renal disease (e.g., elevated serum creatinine) are discovered, coupled with poor exercise tolerance and an intermediate or high-risk surgical procedure, then additional preoperative cardiac testing should also be considered.<sup>18,36</sup> However, such testing should only be performed if the results are likely to have an impact on perioperative management (e.g. before coronary revascularization, modification of perioperative monitoring, changes in medical management).

Preoperatively, it may be helpful to contact the referring general practitioner to obtain more realistic arterial pressure values than the ones measured at hospital admission, which might overestimate the long-term arterial pressure level (referred to as 'white coat' or 'isolated office hypertension').<sup>14</sup>

Perioperative management of patients with essential hypertension who are scheduled for elective or emergency surgery is similar. Despite earlier suggestions that antihypertensive drugs should be discontinued preoperatively, it is now accepted that drugs that effectively control systemic blood pressure



in treated individuals should be continued throughout the peri operative period to ensure optimum medical control of systemic blood pressure. Emergency surgery in patients with poorly or uncontrolled systemic hypertension introduces the question of the safe level for maintenance of the systemic blood pressure during the perioperative period. In this situation, an acceptable approach is to permit the systemic blood pressure to decrease to about 140/90 mm Hg, assuming that this blood pressure is not associated with evidence of target organ ischaemia (or afterload). Electrocardiographic monitoring should focus on detecting signs of ischaemia. Urinary output should generally be closely monitored with an indwelling urinary catheter in patients with renal impairment who are undergoing procedures expected to last more than 2 hours. When invasive haemodynamic monitoring is used, reduced ventricular compliance is often apparent in patients with ventricular hypertrophy; higher pulmonary capillary wedge pressures (12-18 mm Hg) may be required to maintain adequate left ventricular end-diastolic volume and cardiac output.<sup>38</sup>

### INTRAOPERATIVE MANAGEMENT

**Objective:** Perioperative arterial pressure and heart rate control is essential in hypertensive patients. While hypertensive peaks need to be avoided, profound (relative) hypotension, especially when associated with baroreflex-mediated tachycardia, can be equally detrimental. Maintaining arterial pressure perioperatively at 70-100% of baseline and avoiding tachycardia is a key factor in the optimal management of hypertensive surgical patients.<sup>37</sup>

#### Induction

Induction of anaesthesia and endotracheal intubation are often a period of haemodynamic instability for hypertensive patients. Regardless of the level of preoperative blood pressure control, many patients with hypertension display an accentuated hypotensive response to induction of anaesthesia, followed by an exaggerated hypertensive response to intubation. The hypotensive response at induction

may reflect the additive circulatory depressant effects of anaesthetic agents and antihypertensive agents. Many, if not most, antihypertensive agents and general anaesthetics are vasodilators, cardiac depressants, or both. In addition, many hypertensive patients are already volume-depleted. Sympatholytic agents also attenuate the normal protective circulatory reflexes, reducing sympathetic tone and enhancing vagal activity.

Up to 25% of patients may exhibit severe hypertension following endotracheal intubation. The duration of laryngoscopy, which bears some relationship to the degree of hypertension, should be as short as possible. Moreover, intubation should generally be performed under deep anaesthesia (provided hypotension can be avoided). One of several techniques may be used before intubation to attenuate the hypertensive response:

- Deepening anaesthesia with a potent volatile agent
- Administering a bolus of narcotic (fentanyl 2.5-5 g.kg<sup>-1</sup>; alfentanil 15-25 g.kg<sup>-1</sup>; or sufentanil, 0.25-0.5 g.kg<sup>-1</sup>)
- Administering lignocaine, 1.5 g.kg<sup>-1</sup> intravenously or intratracheally.
- Creating beta-adrenergic blockade with esmolol, 0.3-1.5 g.kg<sup>-1</sup>; propranolol 1-5 mg; or labetalol, 10-50 mg)
- Giving nitroprusside 1-2 g.kg<sup>-1</sup>
- Using topical airway anaesthesia
- Premedication with clonidine also appears to be effective in blunting the hypertensive response to intubation

### Choice of Anesthetic Agents

**A. Induction Agents:** The superiority of any agent or technique over another has not been clearly established for hypertensive patients. Even following regional anaesthesia, hypertensive patients frequently have more exaggerated reductions in blood pressure than do normotensive patients. Barbiturates,



benzodiazepines, propofol, and etomidate are equally safe for inducing general anaesthesia in most hypertensive patients. Ketamine itself is contraindicated for elective procedures, because its sympathetic stimulation can precipitate marked hypertension.

**B. Maintenance agents:** Anaesthesia may be safely continued with volatile agents (alone or with nitrous oxide), a balanced technique (narcotic + nitrous oxide + muscle relaxant), high doses of opioids, or other totally intravenous techniques. Regardless of the primary maintenance technique, addition of a volatile agent generally allows satisfactory intraoperative blood pressure control. The vasodilation and relatively rapid and reversible myocardial depression afforded by volatile agents allows titration of their effects against arterial blood pressure. Some clinicians believe that, of the opioids, sufentanil may provide the greatest autonomic suppression and control over blood pressure.

**C. Muscle relaxants:** With the possible exception of pancuronium, any muscle relaxant can be used routinely. Pancuronium-induced vagal blockade and neural release of catecholamines can exacerbate hypertension in poorly controlled patients. When pancuronium is given slowly in small increments, however, marked increases in heart rate or blood pressure are less likely. Hypotension following large (intubating) doses of tubocurarine, metocurine, atracurium and mivacurium may be accentuated in hypertensive patients.

**D. Vasopressors:** Hypertensive patients may display an exaggerated response to both endogenous catecholamines (from intubation or surgical stimulation) and exogenously administered sympathetic agonists. If a vasopressor is necessary to treat excessive hypotension, a small dose of a direct-acting agent such as phenylephrine (25-50g) may be preferable to an indirect agent. Nonetheless, small doses of ephedrine (5-10 mg) are more appropriate when vagal tone is high. Patients taking sympatholytics preoperatively may exhibit a decreased response to vasopressors especially ephedrine.

## Intraoperative Hypertension

Intraoperative hypertension not responding to an increase in anaesthetic depth (especially with a volatile agent) can be treated with a variety of parenteral agents. Readily reversible causes such as hypoxemia or hypercapnia should always be excluded before initiating antihypertensive therapy. Selection of a hypotensive agent depends on the severity, acuteness, and cause of hypertension, the baseline ventricular function, the heart rate, and the presence of bronchospastic pulmonary disease. Nitroprusside remains the most rapid and effective agent for the intraoperative treatment of moderate to severe hypertension. Nitroglycerine may be less effective but is also useful in treating or preventing myocardial ischaemia. Beta-adrenergic blockade alone or as a supplement is a good choice for a patient with good ventricular function and an elevated heart rate but is contraindicated in the presence of bronchospastic disease; nicardipine may be preferable for the latter. Hydralazine provides sustained blood pressure control but has a delayed onset and is often associated with reflex tachycardia. The latter is not seen with labetalol because of combined alpha- and beta-adrenergic blockade.

## Cardiac Protection

As hypertension is strongly associated with cardiovascular disease, and as cardiac events are the main cause of adverse perioperative outcome, the perioperative anaesthetic management of hypertensive patients must place particular emphasis on cardiac protection. This may be achieved by perioperative beta-blockade<sup>39</sup> and possibly by pharmacological preconditioning<sup>21,40</sup>

Two major outcome studies have demonstrated a reduction in mortality in patients with or at risk of coronary artery disease by perioperative beta-blocker therapy.<sup>41,42</sup> Hypertensive patients with the associated high incidence of coronary artery disease are likely to benefit from aggressive perioperative treatment with beta-blockers, preferably beta-1 selective antagonists<sup>43</sup>.



Pharmacological preconditioning by inhalational anaesthetics may become another means of perioperative cardiac protection.<sup>44</sup> Inhalational anaesthetics seem to improve tolerance of myocardial ischaemia by acting as openers of mitochondrial and sarcolemmal ATP-regulated potassium (KATP) channels.<sup>45</sup> This may be of particular benefit in hypertensive patients given the high prevalence of associated coronary artery disease<sup>3</sup> and their vulnerability to perioperative myocardial ischaemia.<sup>15</sup> In contrast, as sulphonylurea hypoglycaemic agents close KATP channels to increase insulin release from pancreatic islet cells, they may prevent anaesthetics from exerting pharmacological preconditioning and associated cardiac protection. It is thus advisable to discontinue such drugs 1-2 days before elective surgery.<sup>20</sup>

### POSTOPERATIVE MANAGEMENT

Postoperative hypertension is common and should be anticipated in patients who have poorly controlled hypertension. Close blood pressure monitoring should be continued in both the recovery room and the early postoperative period. In addition to myocardial ischaemia and congestive heart failure, marked sustained elevations in blood pressure can contribute to the formation of wound haematoma and the disruption of vascular suture lines.

Hypertension in the recovery period is often multi-factorial and enhanced by respiratory abnormalities, pain, and volume overload or bladder distention. Contributing causes should be corrected and parenteral antihypertensive agents given if necessary. Intravenous nicardipine or sublingual nifedipine is useful in controlling blood pressure in this setting, particularly if myocardial ischaemia is suspected or bronchospasm is present. When the patient resumes oral intake, preoperative medications should be restarted.

### CONCLUSION

There is general agreement based on the evidence presented by Howell and colleagues<sup>14</sup> that patient with mild (BP 140-159/90-99 mmHg) and

moderate hypertension (160-170/100-109 mmHg)<sup>8</sup> and no evidence of coronary artery disease or end-organ damage may safely undergo surgery without delay. In contrast, for patients with severe (> 180/> 110 mmHg)<sup>8</sup> hypertension the data are insufficient to allow an unequivocal recommendation as to what constitutes the optimal approach. Any recommendation to postpone elective surgery for the purpose of preoperative arterial pressure control must be balanced against the urgency and benefit of the planned operation; must take into account that arterial pressure should be corrected slowly, and that up to 2 months may be required to reverse some of the hypertension-induced cardiovascular changes<sup>19</sup> and must acknowledge the fact that data are lacking to support such practice.

Chronic hypertension may go undetected for a long time. It may well be found for the first time during routine preoperative assessment. Modern anaesthesia provided by a well trained, experienced and dedicated anesthesiologists offers sufficient perioperative cardiac protection to make cancellation of surgery for the sole purpose of controlling preoperative hypertension unnecessary under most circumstances. Appropriate evaluation and intervention can be expected to improve perioperative and long-term outcome. When confronted with uncontrolled preoperative hypertension, we need to remain wary but not become unduly alarmed.

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## **The Expanding Role of Anaesthesiologists** **8th Congress SAARC Association of Anaesthesiologists**

5th -8th February, 2009, Hotel Sheraton Karachi

### **Pre-Congress Workshops:**

2nd-4th February, 2009 at CHK, AKUH, JPMC, SIUT, ASH, LNH, Indus and Patel Hospital.

### **Pre-Congress CME Lectures:**

5th February, 2009, Timings: 10:00 am - 1:00 pm, Venue: Hotel Sheraton.

15 update lectures in 3 halls by giants of the field from all over the world will be speaking.

### **Satellite Sessions:**

Lahore and Rawalpindi-Islamabad on 9th and 10th February 2009 respectively

SAARCAA's main initiation was intended as a means of endorsing scientific and cultural diversity and similarities between its member countries, in order to promote an atmosphere where clinicians could learn from each other's clinical experience in the fields of anaesthesiology.

The theme of this congress is "The Expanding Role of Anaesthesiologists", which has already widened to include critical care, pain management, trauma, resuscitation and the redefined role of anaesthesiologists as perioperative physicians. Our theme and emblem depict the open chains on either side symbolizing room for further expansion.

With this perspective in mind, it would indeed be a matter of immense pleasure if you join hands with us in achieving these objectives and accept our invitation to participate in this congress.

**Contact no for registration:** +92-21-2765673, Fax:+92-21-2779718

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